VAN WYCK EXPRESSWAY (VWE) CAPACITY AND ACCESS IMPROVEMENT TO JFK AIRPORT – CONTRACT 2

PIN X735.83, Contract D900050

DB CONTRACT DOCUMENTS REQUEST FOR PROPOSALS

PART 8

SPECIAL SPECIFICATIONS

Final April 21, 2020

This *Part 8 – Special Specifications* provides access to, and details the Project-specific requirements for the use of, the following documents:

1. NYSDOT Standard Specifications and Construction Materials
2. NYSDOT Engineering Information Issuances
3. NYSDOT Special Specifications.

NYSDOT Standard Specifications and Construction Materials

The Design-Builder shall use the NYSDOT Standard Specifications Construction Materials in coordination with *Part 5 – Special Provisions*.

The NYSDOT Standard Specifications Construction Materials can be accessed at the following internet link:

https://www.dot.ny.gov/main/business-center/engineering/specifications/busi-e-standards-usc.

NYSDOT Engineering Information Issuances

The Design-Builder shall use the relevant NYSDOT engineering information issuances, which include:

1. Engineering Instructions (EI);
2. Engineering Bulletins (EB);
3. Engineering Directives (ED).

The above listed engineering information issuances can be accessed at the following internet link:

https://www.dot.ny.gov/main/business-center/consultants/forms-publications-and-instructions/engineering-information-issuance-system

NYSDOT Special Specifications

The Design-Builder *may* use NYSDOT Special Specifications which are listed in the Electronic Pay Item Catalog (e-PIC) and which have received General Approval, and **shall** use any NYSDOT Special Specifications which are referenced in this Part 8 or elsewhere in the Contract Documents. Delete and ignore sections in the NYSDOT Special Specifications titled *Method of Measurement* and *Basis of Payment* from the NYSDOT Special Specifications.

NYSDOT Special Specifications can be accessed at the following internet link:

https://www.dot.ny.gov/main/business-center/engineering/specifications/special-specifications-us.

The NYSDOT e-PIC may be accessed at the following internet link:

https://www.dot.ny.gov/pic

The following Special Specifications are attached herein:

ITEM 551.04000010 – TREATED TIMBER PILES
ITEM 555.02000001 – CONCRETE FOR STRUCTURES CLASS MP (MASS PLACEMENT)
ITEM 555.80020001 – CRACK REPAIR BY EPOXY INJECTION (RESTORATION)
ITEM 557.01040018 – LIGHTWEIGHT, HIGH – PERFORMANCE SUPERSTRUCTURE SLAB WITH INTEGRAL WEARING SURFACE – BOTTOM FORMWORK REQUIRED
ITEM 557.22040016 – FIELD CAST UHPC CLOSURE POURS (VOLUME)
ITEM 557.2500NN16 – CRACK SEALING USING HIGH MOLECULAR WEIGHT METHACRYLATE – LINEAR CRACKS
ITEM 557.2600NN16 – CRACK SEALING USING HIGH MOLECULAR WEIGHT METHACRYLATE – FLOODING
ITEM 557.6401XX03 – PRECAST CONCRETE DECK – TYPE XX FRICTION
ITEM 557.11010003 – INTEGRAL PRECAST CONCRETE BARRIER
ITEM 559.16960118 – PROTECTIVE SEALING OF STRUCTURAL CONCRETE
ITEM 559.18960118 - PROTECTIVE SEALING OF STRUCTURAL CONCRETE ON NEW BRIDGE DECKS AND BRIDGE DECK OVERLAYS
ITEM 559.91100010 – ANTI-GRAFFITI PROTECTIVE COATING
ITEM 559.92010011 – GRAFFITI REMOVAL
ITEM 564.20010008 – HOT-DIP GALVANIZING OF STRUCTURAL STEEL
ITEM 572.00020101 – METALIZING
ITEM 603.95120011 – DUCTILE IRON PIPE ON CRUSHED STONE BEDDING, 12 IN DIA (NYC)
ITEM 603.95320011 – DUCTILE IRON PIPE, 12-INCH DIAMETER (NYC)
ITEM 604.02010011 – CATCH BASIN – TYPE 1 (NEW YORK CITY)
ITEM 604.04020011 – NYC STANDARD FOR 4 FOOT DIAMETER PRECAST MANHOLE
ITEM 604.04030011 – NYC STANDARD FOR 5 FOOT DIAMETER PRECAST MANHOLE
ITEM 604.04040011 – NYC STANDARD FOR 6 FOOT DIAMETER PRECAST MANHOLE
ITEM 604.04850011 – NYC STANDARD MANHOLE TYPE A-1
ITEM 604.04890011 – NYC STANDARD MANHOLE TYPE A-3
ITEM 609.26020111 – CONCRETE CURB, STEEL FACED (NYC), TYPE D
ITEM 609.26520011 – STEEL FACING FOR CURB ON STRUCTURE (NYC), TYPE D
ITEM 610.16010139 – ESTABLISHING TURF WITH ENDOPHYTES (PANYNJ)
ITEM 611.190X0024 – POST-PLANTING CARE WITH REPLACEMENT
ITEM 613.70XX0011 – BIRD REPELLANT SYSTEM
ITEM 619.10040020 – PORTABLE WORK ZONE CAMERA
ITEM 619.22970011 – TRAFFIC ENFORCEMENT AGENTS
ITEM 634.900X0011 – RODENT AND VERMIN CONTROL
ITEM 634.99010017 – BUILDING CONDITION SURVEY
ITEM 634.99020017 – VIBRATION MONITORING (NONBLASTING)
ITEM 637.31XX0020 – INSPECTION VEHICLES (MAXIMUM BID)
ITEM 637.4000NN20 – WEBCAM SYSTEM
ITEM 655.00XX0011 – CAST FRAMES AND GRATES AND MANHOLE COVERS
ITEM 680.17006011 – 60 FOOT CAMERA POLE
ITEM 680.51960011 – FURNISH AND INSTALL CONCRETE FIBER OPTIC PULL BOX

ITEM 680.53000111 – S.S. NEMA-4X STRUCTURE MOUNTED PULLBOX (16” X 12” X 8”)
ITEM 680.92124411 – SINGLE MODE FIBER OPTIC TRUNK CABLE 144 FIBER (IN CONDUIT)
ITEM 680.92127211 – SINGLE MODE FIBER OPTIC TRUNK CABLE 72 FIBER (IN CONDUIT)
ITEM 680.95020615 – SERVICE CABLE 2 CONDUCTOR, NO. 06 AWG
ITEM 680.95533211 – METER CABINET
ITEM 680.95663211 – RANGING RADAR DETECTOR ASSEMBLY
ITEM 680.99120011 – FIBER OPTIC INNERDUCT, 1 CHANNEL
ITEM 683.09150011 – TRANSMIT TAG READER
ITEM 683.09150111 – TRANSMIT ANTENNA
ITEM 683.10110008 – HD IP CAMERA ASSEMBLY – BARREL TYPE
ITEM 683.92211208 – FIBER OPTIC CABLE – 12 FIBERS
ITEM 800.01000015 – DESIGN BUILD – DESIGN SERVICES
ITEM 800.02000015 – DESIGN BUILD – CONSTRUCTION INSPECTION SERVICES
ITEM 800.03000015 – DESIGN BUILD – QUALITY CONTROL SERVICES
ITEM 800.04000015 – DESIGN BUILD – FORCE ACCOUNT WORK
ITEM 800.05000015 – DESIGN BUILD – SITE MOBILIZATION
ITEM 800.06000115 – DESIGN BUILD – CONSTRUCTION WORK
ITEM 800.06XXNN15 – DESIGN BUILD – CONSTRUCTION WORK – STRUCTURAL REPAIRS
ITM 800.0700XX15 – DESIGN BUILD – MATERIALS
ITEM 800.1000NN15 – DESIGN BUILD – UTILITY RELATED WORK

In the event of a discrepancy between the version of any Special Specification attached herein and the version available from the NYSDOT web site listed above, the version included in these Contract Documents shall apply.

ITEM 551.04000010 – TREATED TIMBER PILES

DESCRIPTION

Under this work the Contractor shall furnish and place timber piles of the type and size and at the locations indicated on the plans, or where ordered by the Engineer.

MATERIALS

Materials for piling shall conform to the requirements shown on the plans and the applicable subsections of Section 700 - Materials.

CONSTRUCTION DETAILS

A. **Preparation of Piles.**

1 **Points.** The tips of timber piles shall be sawed square so that, when cut off, the end is perpendicular to the longitudinal axis of the pile or tapered to a point not less than 4” in diameter.
2 **Butts.** The butts of timber piles shall be sawed square.
3 **Splices.** Timber piles shall not be spliced.

B. **Methods of Driving.** The driving of piles shall be done with an air/steam, Diesel, or hydraulic hammer. The order of driving will be determined by the Engineer. Equipment utilized for driving timber piles shall conform to the requirements of Section 551-3.01.D with the exception that the minimum rated striking energy of the hammer to be used in driving piles shall be 7006 ft-lbf (9.5 KJ) per blow, and the maximum rated striking energy shall be 13,497 ft-lbf (18.3 KJ) per blow.

C. **Preservative Treatment.** The preservative treatment shall be applied to the timber piles as indicated on the plans and shall conform to Section 720-02.

D. **Length of Piles.** All piles shall be driven to a predetermined depth as shown on the plans.

E. **Allowable Variation in Pile Alignment.** Piles shall be truly vertical or accurately battered as indicated on the plans. The top of any pile driven its full length into the ground shall not vary from the plan location by more than 4 inches.

F. **Defective Piles.** All piles forced up by any cause shall be driven down again, as directed by the Engineer. The following shall be causes for rejection of a pile:

1. Pile location or batter is incorrect.
2. Pile damaged from any cause whatsoever.
3. Pile tip elevation is not within the limits called for on the plans, or specified by the Engineer.
4. Pile is determined by the Engineer to be unserviceable for other reasons related to the furnishing and installing of the pile.

The Contractor shall remove such rejected piles, or at the option of the Engineer, a second pile may be driven adjacent thereto, if this can be done without impairing the structure.

ITEM 551.04000010 – TREATED TIMBER PILES

Timber Piles which are driven so that, when cut off, the tops are below the elevation fixed by the plans or as established by the Engineer, shall be withdrawn and replaced by new and, if necessary, longer piles at the expense of the Contractor.

Piles that are split, splintered or broomed from driving operations are not acceptable. Any pile broken by reason of internal defects (even though the Engineer permitted it to be put in the leads), or by improper driving shall be rejected.

G. Cutting Off of Piles. The tops of all piles shall be cut off at the elevation indicated on the plans or as specified by the Engineer. The cut shall be clean and to a true plane, in accordance with the detail shown on the plans or as required by the D.C.E.S. The sawed surface shall be treated as shown on the plans. All cut off lengths shall become the property of the Contractor and shall be removed by him from the site of work

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H. Associated Work. All cavities or voids, left by the extraction of damaged piles or from auger bolts or soil deformations necessary to place piles, shall be backfilled as specified by the Engineer.

I. Storage, Handling and Inspection. The method of storing and handling of piles shall be such as to avoid injury to the piles. Timber piles shall be handled with special care so as to avoid breaking the surface of the piles. They will be first inspected at the wood preservative treating plant and shall be subject to further inspection upon arrival at the job site.

METHOD OF MEASUREMENT

The quantity of piles to be paid for under the work specified will be the number of feet of driven, acceptable piles, measured below the cut off elevation, remaining in the finished structure in accordance with the plans, specifications, and orders of the Engineer.

BASIS OF PAYMENT

The unit price bid per foot for each pile shall include the cost of furnishing all labor, materials and equipment necessary to complete the work as prescribed in these specifications including the following additions:

A. Equipment for Driving Timber Piles. The cost of furnishing all labor, materials, and equipment necessary for transporting, erecting, maintaining, making any ordered equipment replacement, dismantling and removing the entire pile driving equipment shall be included in the unit price bid.

B. Defective Piles. No payment will be made for piles rejected in accordance with the requirements under Construction Details - Section F, Defective Piles.

ITEM 551.04000010 – TREATED TIMBER PILES

C. Backfilling. Payment for backfilling of all cavities left by the extraction of damaged piles or from auger holes or soil deformations necessary to place piles shall be included in the work for the respective pile item.

D. Redriving Piles. The cost driving piles that are forced up by any cause shall be included in the unit price bid for the respective pile item.

E. Pile Shoes, etc. The cost of furnishing and using pile shoes, followers, augers or spuds shall be included in the unit price bid.

ITEM 555.02000001 - CONCRETE FOR STRUCTURES CLASS MP (MASS PLACEMENT)

DESCRIPTION:

Furnish and place portland cement concrete with a minimum compressive strength of 3000 psi where specified on the Plans for mass concrete placements of structural elements. Follow §555, except as noted below.

MATERIALS:

§555-2, except as modified herein.

Using materials meeting the requirements of §501-2.02 and as indicated below, design a concrete mixture(s) based on the following criteria.

- Strength - 56 day minimum compressive strength of 3000 psi.
- Slump - 3 inches +/- 1 inch. A high range water reducing admixture may be used upon prior written approval from the Director, Materials Bureau. If adding a high range water reducing admixture, slump will be limited to 3 inches maximum before the addition. After the addition, slump will be limited to 8 inches maximum.
- Entrained Air - 5 to 8%.
- Water/Total Cementitious Material Ratio - 0.40 maximum.
- Class F Fly Ash - 20% to 50% by weight of cementitious materials.
- Cement, Type II only.

Perform mix development testing in accordance with ASTM C143, C231, C192 and C39 to assure all performance criteria can be achieved during production and placement.

An equal mix design may be submitted for evaluation to the Director, Material Bureau for approval.

At least one month prior to the start of any concrete placement, provide a copy of the proposed mixture design(s) and trial batch test results to the Director, Materials Bureau, submitted through the Engineer, for evaluation. Submit sufficient data to permit the Director to offer an informed evaluation. Include at least the following:

- Concrete mix proportions.
- Material sources. Also include fineness modulus and specific gravity for all aggregates.
- Air content of plastic concrete.
- Slump of plastic concrete.
- Compressive strength at 7, 14, 28, and 56 days and at any other age tested or deemed necessary.

- Temperature/time relation (Interior of concrete with autogenous curing boxes) for 7 days measuring at hourly intervals.

Do not interpret having a valid mixture design as approval of the mixture. Resubmit any proposed mixture design change to the Director, Materials Bureau, for evaluation. Multiple mixture designs may be used to address performance and placement issues as deemed necessary by the Contractor. Submit each mixture for evaluation, as indicated above, prior to use.

CONSTRUCTION DETAILS:

Follow §555-3, except as modified herein:

Replace §555-3.01 - Concrete Manufacturing and Transporting with:
§501-2.03 - Concrete Batching Facility Requirements,
§501-2.04 - Concrete Mixer and Delivery Unit Requirements,
§501-3.02 - Handling, Measuring, and Batching Materials, and
§501-3.03 - Concrete Mixing, Transporting, and Discharging, except that the maximum concrete temperature at the point of discharge shall be as specified in the Thermal Control Plan.

The Contractor shall prepare a Thermal Control Plan prior to placement of the mass concrete.

Thermal Control Plan:

The Thermal Control Plan shall at a minimum include a Heat Dissipation Study (Reference ACI 207 or thermal modeling software) as well as to describe the measures and procedures the Contractor intends to use to satisfy the following Temperature Control Requirements for each mass concrete element:

i. The Maximum Temperature Differential shall be limited to 35 degrees F. The temperature differential between the interior and exterior portions of the designated mass concrete elements during curing will be maintained to be less than or equal to this Maximum Temperature Differential, and

ii. The Maximum Allowable Plastic Concrete Temperature shall be limited to 160 degrees F.

A change to the Temperature Control Requirements specified above can be addressed in the Thermal Control Plan through Heat Dissipation Studies to demonstration that deleterious effects to the concrete can be avoided through adherence to the Thermal Control Plan. Such a change requires approval by the D.C.E.S.

ITEM 555.02000001 - CONCRETE FOR STRUCTURES CLASS MP (MASS PLACEMENT)

As a minimum, the Thermal Control Plan shall include the following:

A. Concrete mix design. If the mix will be cooled, the Contractor shall define the methodology and necessary equipment to achieve these mix temperatures.

B. Duration and method of curing.

C. Methods of controlling temperature differentials, inclusive of active coolant systems not previously defined within the Engineering Drawings.

D. An analysis of the anticipated thermal developments in the mass concrete elements for all expected project temperature ranges using the proposed mix design, casting procedures, and materials. It shall show complete details and determine the maximum temperature differentials within the concrete mass.

E. Temperature sensor types and locations including installation details.

F. Temperature Monitoring System including system description, operating plan, recording and reporting plan, and remedial action plan.

G. Field measures and documentation procedures to ensure conformance with the maximum concrete temperature and temperature differential requirements.

H. Field methods of applying immediate corrective action should the temperature differential approach the Maximum Temperature Differential and Maximum Allowable Concrete Temperature.

The Contractor shall submit the Thermal Control Plan to the Engineer for approval a minimum of thirty working days prior to concrete placement. Mass concrete placement shall not begin until the D.C.E.S. has approved the Thermal Control Plan.

Acceptance/Testing of concrete shall follow §555-3.04 C, meeting the specified requirements of this specification and the Thermal Control Plan.

Modify §555-3.06 - Concrete Joints: Structural elements may be constructed in stages using construction joints if permission is granted by the Deputy Chief Engineer for Structures Design and Construction.

Modify §555-3.10 - Loading Limitations: After the minimum curing period, concrete may receive construction loads after reaching a compressive strength of 2500 psi. Testing will be in

accordance with Note 3 of Table 555-4.

All concrete for this item shall achieve 3000 psi prior to opening the structure to traffic. Compressive strengths shall be determined from cylinders stored and cured in the same manner as the concrete it represents. The average compressive strength of each cylinder set shall be greater than the desired compressive strength, with no individual cylinder less than 90% of the desired compressive strength.

Temperature Monitoring System:

The temperature monitoring and recording system for mass concrete shall consist of temperature sensors connected to a data acquisition system capable of printing, storing, and downloading data to a computer. Temperature sensors shall be located such that the maximum temperature difference within a mass concrete element can be monitored. As a minimum, concrete temperatures shall be monitored from the center of the concrete mass, the base of the mass, the surface of the mass, and the center of an exterior outer face that is the shortest distance from the center of the concrete mass.

Temperature readings shall be automatically recorded on an hourly basis or as required by the Engineer. A redundant set of sensors shall be installed near the primary set. Provision shall be made for recording the redundant set, but records of the redundant sensors need not be made if the primary set is operational.

Methods of concrete consolidation shall prevent damage to the temperature monitoring and recording system. Wiring from temperature sensors cast into the concrete shall be protected to prevent movement. Wire runs shall be kept as short as possible. The ends of the temperature sensors shall not come into contact with either a support or concrete form, or reinforcing steel.

When any equipment used in the temperature control and monitoring and recording system fails during the mass concrete construction operation, the Contractor shall take immediate remedial measures to correct the situation as specified in the Thermal Control Plan.

Temperature reading will begin when mass concrete placement is complete. Temperature readings will continue until the maximum temperature differential (not maximum temperature) is reached and a decreasing temperature differential is confirmed as defined in the Thermal Control Plan. Furnish a copy of all temperature readings daily.

If monitoring indicates that the temperature differential is approaching the maximum temperature differential of 35 degrees F, the Contractor shall take immediate corrective action as defined in the Thermal Control Plan to retard further increase of the temperature differential. The Contractor will make the necessary revisions to the approved Thermal Control Plan to satisfy the

temperature control requirements on future placements. Revisions to the plans must be approved by the Engineer prior to implementation.

§555-3.13 - Damaged or defective concrete, applies with the following additions:

If mass concrete temperature differentials are exceeded, provide all analyses and test results deemed necessary by the D.C.E.S. for determining the structural integrity and durability of the mass concrete element, to the satisfaction of the D.C.E.S.. The Department will make no compensation, either monetary or time, for the analyses, tests or any impacts upon the project.

Any cracks in the structural element greater than 0.016 inches resulting from the contractor's inability to properly maintain concrete temperature differentials, shall be repaired using epoxy injection at no additional cost to the Department. The effectiveness of repairs shall be demonstrated by the contractor using evaluation methods acceptable to the Department. The Engineer-In-Charge will be responsible for accepting or rejecting the repairs after the field evaluation.

METHOD OF MEASUREMENT:

Cubic yards as per §555-4.

BASIS OF PAYMENT:

§555-5, including the cost of the mix design and Thermal Control Plan in the unit bid price per cubic yard

ITEM 555.80010001 - CRACK SEALING BY EPOXY INJECTION (PREVENTION)
ITEM 555.80020001 - CRACK REPAIR BY EPOXY INJECTION (RESTORATION)

DESCRIPTION: Install injection ports, seal the crack opening, inject the crack with epoxy (full depth for restoration work, or as deep as conditions allow for prevention work), and restore the sealed surface to a flush condition in areas visible to the public. Perform the work at locations indicated on the contract plans or where directed by the Engineer.

PREVENTION - use in contaminated, cracked concrete areas to prevent movement and protect reinforcing.

RESTORATION - use in uncontaminated cracked concrete areas to restore structural integrity. Take verification cores for payment. Have an experienced epoxy manufacturer representative present until the work is acceptable to the Engineer.

MATERIAL REQUIREMENTS:

1. Crack Sealant - epoxy paste that completely cures in 4 hours or less and retains the injected epoxy. Any other type of crack sealant is subject to a project demonstration and approval by the Engineer.

2. Low Viscosity Injection Epoxy - Manufacturer certified to meet ASTM C881, Type I or IV, Grade 1, Class B or C (as temperature conditions require.)

3. Vertical & Overhead Patching Material (Approved List) - (for ITEM 555.80020001) §701-08

INJECTION EQUIPMENT: Use equipment in good working order, as approved by the Engineer, with the following features:

- Separate feed lines to the mixing chamber
- Automatic mixing and metering pump
- Ability to thoroughly mix the epoxy components in the mixing chamber
- Operator control of the epoxy flow from the mixing chamber
- Clean, legible, accurate pressure gauges easily viewable by the operator
- Ability to provide an uninterrupted pressure head to continually force epoxy into the cracks
- Injection pressure from 0 to at least 200 PSI
- Capable of metering each epoxy component to within 3.0% of the epoxy manufacturer's mix ratio

Un-reacted epoxy components may be stored overnight in separate reservoirs and feed lines.

Before starting the work, demonstrate to the Engineer the ability of the equipment to meter and mix epoxy components to the required mix ratio. Ratio accuracy may be determined by simultaneously metering each component into separate, clean, accurately graduated, volumetric containers, or another procedure approved by the Engineer. Also, activate the automatic mixing and metering pump, mix a small amount of injection epoxy, and waste it into a disposable container. The Engineer will observe this trial operation and be satisfied the equipment is working properly, and the epoxy is mixed with no streaks.

CONSTRUCTION DETAILS:

ITEM 555.80010001 - CRACK SEALING BY EPOXY INJECTION (PREVENTION)
ITEM 555.80020001 - CRACK REPAIR BY EPOXY INJECTION (RESTORATION)

1. Crack and Surface Preparation. Remove all debris or contaminants accessible within the cracks by using hand tools, water blasting or oil-free high pressure air blasting, vacuuming, or other methods suitable to the Engineer. Epoxy resin will not penetrate: compacted, water or oil soaked debris. Allow free moisture within the crack to be absorbed before injecting epoxy. Remove all materials, including moisture, from the surface adjacent to the crack which might interfere with bonding of the crack sealant.

2. Injection Port Installation. Attach injection ports to the prepared surface by placing them onto (surface adapters) or into the cracks (socket ports) and affixing with crack sealant. Larger cracks may be ported by inserting an anchored tube into the crack.

   Use positive connection port designs to connect injection equipment to the ports. Other injection port designs and attachment methods, where worker fatigue would not be a problem, require approval by the Engineer.

   Use the following general guidelines for spacing injection ports when cracks are uniform in width through the structure. For cracks that get tighter with depth, double this spacing. Intermediate ports may be placed for observation. To permit maximum flow into the void, position ports on the wider crack sections and at intersections, rather than at an exact spacing.

   If these guidelines cannot be followed, use port locations approved by the Engineer. Port spacing may be modified by the Engineer as experience is gained, or when cores are taken to determine penetration.

   FOR CRACKS COMPLETELY THROUGH A MEMBER

   A. Cracks accessible from one side - space the ports not less than the thickness of the member.

   B. Cracks accessible from both sides - space the ports not less than twice the thickness of the member and stagger them relative to the ports on the opposite side. Make the stagger between ports (on opposite sides of the member) at least the thickness of the member.

   Place the endmost ports at the ends of the crack so as to insure complete filling of the crack.

   FOR MULTIPLE CRACKS ALL OVER A MEMBER.
   Space the ports as far apart as practical, but not less than 8” from one another. An 8” spacing presumes a 4” penetration in each direction, if the adjacent ports are not plugged when epoxy reaches them. For fine cracks that taper to an end, place the endmost ports about 4” from the end.

3. Crack Seal. After port installation, seal the crack opening with crack sealant, being careful not to plug the injection ports. Allow the crack sealant to cure completely before injecting epoxy.

   Apply crack sealant only when surface and ambient temperatures are above 50º F.

4. Port Flushing. Prior to any epoxy injection, flush critical ports with oil-free compressed air to verify that air exits from all the installed ports, dry the cracks, and check for leaks.

5. Epoxy Injection. Perform epoxy injection only when the surface and ambient temperatures are above 45º F and are not expected to fall below 45º F during the next 24 hours.

   UNIFORM WIDTH CRACKS - start toward the middle of a horizontal crack and work outward, or the lowest point of a sloping or vertical crack and work upward.

   VARIABLE WIDTH CRACKS - start at the widest points of all types of cracks and work outward. Secure the feed line to the first port. Initiate and continue flow until epoxy exits from the adjacent port. (Plug observation ports and continue through the same port to achieve maximum penetration.) Temporarily stop the injection process, remove the feed line, and seal the port. Attach the feed line to the adjacent port and repeat this procedure along the crack until the last port is sealed.

   Generally, use higher pressures when injecting narrow deep cracks, medium to low for wider cracks, and lowest pressures when injecting a delaminated area or an area susceptible to lifting. Low pressure applied for a longer duration is often more effective than high pressure applied for a shorter duration.

   Replenish the epoxy supply in the mixing equipment before it is exhausted. Thoroughly stir each epoxy component both before and after adding it to its respective component in the mixing equipment. Exercise care to assure a continuous injection operation.

   Allow the epoxy to fully cure prior to performing subsequent work in the repaired area.

   In the event of leakage from a crack, stop the injection process until the leak is sealed. When any work stoppage exceeds 15 minutes, clean the mixing chamber and flush the line that carries mixed epoxy. Flush with a suitable solvent, followed by air.

6. For ITEM 555.80020001 CRACK REPAIR BY EPOXY INJECTION (RESTORATION), take cores ranging in diameter from 1 to 4", as approved by the Engineer, to verify full penetration by epoxy and its cure. Take a representative core from each structural element, or one from every 100 feet of crack repaired, whichever is greater, at locations approved by the Engineer. The Engineer will retain the cores and determine if they are acceptable for payment. Patch the holes with Vertical & Overhead Patching Material.

   More than one core may be necessary to obtain an acceptable sample from cracks that diverge below the surface. (To avoid cutting reinforcing, the core drill may be angled to intercept a crack behind the reinforcing.)

7. Clean Up. In all areas visible to the public, as determined by the Engineer, remove spillage, the ports and crack sealant until flush with the adjacent surface. Remove stains and repair any damage to the satisfaction of the Engineer at no additional cost.

ITEM 555.80010001 - CRACK SEALING BY EPOXY INJECTION (PREVENTION)
ITEM 555.80020001 - CRACK REPAIR BY EPOXY INJECTION (RESTORATION)

METHOD OF MEASUREMENT: The Engineer will measure the work as the number of linear feet of crack sealed or repaired, as specified.

BASIS OF PAYMENT: Include the cost of all labor, materials, and equipment necessary to complete the work in the unit price bid per linear foot. For ITEM 555.80020001 CRACK REPAIR BY EPOXY INJECTION (RESTORATION), also include the cost of coring and repairing the core holes.

For ITEM 555.80010001 CRACK SEALING BY EPOXY INJECTION (PREVENTION), the Engineer will authorize payment after the measured length of crack has been sealed and the surface cleaned.

For ITEM 555.80020001 CRACK REPAIR BY EPOXY INJECTION (RESTORATION), the Engineer will authorize payment after the measured length of crack has been repaired as verified by cores, the core holes patched and the surface cleaned.

ITEM 557.01040018 - LIGHTWEIGHT, HIGH - PERFORMANCE SUPERSTRUCTURE SLAB WITH INTEGRAL WEARING SURFACE - BOTTOM FORMWORK REQUIRED

ITEM 557.05040018 - LIGHTWEIGHT, HIGH - PERFORMANCE SUPERSTRUCTURE SLAB WITH INTEGRAL WEARING SURFACE - BOTTOM FORMWORK NOT REQUIRED

ITEM 557.07040018 - LIGHTWEIGHT, HIGH - PERFORMANCE SUPERSTRUCTURE SLAB WITH SEPARATE WEARING SURFACE - BOTTOM FORMWORK REQUIRED

ITEM 557.09040018 - LIGHTWEIGHT, HIGH - PERFORMANCE SUPERSTRUCTURE SLAB WITH SEPARATE WEARING SURFACE - BOTTOM FORMWORK NOT REQUIRED

DESCRIPTION. Furnish and place lightweight, high performance (Class HP) concrete to construct superstructure slabs as shown in the contract documents.

MATERIALS. Use materials meeting §557-2. Perform additional work as follows:

A. Design. Design a lightweight, high-performance concrete mixture, proportioned according to the American Concrete Institute Manual of Concrete Practice, ACI 211.2, Standard Practice for Selecting Proportions for Structural Lightweight Concrete.

1. Produce a homogeneous mixture of cement, pozzolan (Fly Ash or GGBFS), microsilica, fine aggregate, lightweight coarse aggregate, air entraining agent, normal range set-retarding, water-reducing admixture, and water, as designed.

2. Use Type I, I/II, II (§701-01) or Type SF (§701-03) cement. Use a minimum cementitious content of 675 lb/yd³. Use 15-20% pozzolan (§711-10, Flyash, or §711-12 GGBFS), and 6-10% microsilica (§711-11).

3. Use lightweight coarse aggregate conforming to §703-10, with a gradation in the 3/4 inch to No. 4 size designation in ASTM C330, Table 1.

4. Determine the cement content for each trial batch by means of a yield test according to ASTM C138.

a. At least 10 working days prior to concrete placement, provide the Materials Engineer with a copy of the trial mix design with the following data:

- Fine and coarse aggregate (saturated, surface dry condition) content in lb/yd³.
- Cementitious content in lb/yd³.
- Water content in lb/yd³.
- Unit weight of freshly mixed concrete in accordance with ASTM C138.
- Dry unit weight in accordance with ASTM C567.
- 28-day compressive strengths.
- Batch quantities of all materials as they will appear on the batch record.

b. The Materials Engineer, or their representative, will approve the batch quantities prior to use. Use these values to manufacture all lightweight concrete for this project, and periodically correct the batch weights to account for changes in the fine aggregate fineness modulus and aggregate moisture contents in accordance with Materials Method 9.1, or current Department directives.

B. Stockpile Handling. Construct lightweight coarse aggregate stockpile(s) at the production facility so as to maintain uniform moisture throughout the pile. Continuously and uniformly sprinkle the stockpile(s) with water using a sprinkler system approved by the Materials Engineer. Soak for a minimum of 48 hours, or until the stockpile has achieved a

minimum internal moisture content of 15% by weight. If a steady rain of comparable intensity occurs, turn off the sprinkler system.

If the rain ceases prior to the end of the wetting period, restart the sprinkling system. At the end of the wetting period, or when a rainfall ceases beyond the end of the wetting period, allow stockpiles to drain for 12 to 15 hours immediately prior to use.

C. Sampling of Materials. The Materials Engineer's representative, will take a 1 liter sample of microsilica in accordance with Materials Method 9.1, or current Department directives, for each day's placement for testing. Sampling of other materials will be at the direction of the Regional Materials Engineer.

D. Batching. After the materials have been accepted for this work, determine the proportions for concrete and equivalent batch weights based on trials made with materials to be used in the work.

• If densified microsilica powder is used and added independently - weigh cumulatively in the following order: cement, fly ash (or GGBFS), then microsilica. Base the batching tolerance of ± 0.5 % on the total weight of cementitious material, for each material draw weight.

• If densified microsilica powder is used as part of blended cement - weigh cumulatively in the following order: blended cement, then fly ash (or GGBFS). Base the batching tolerance of ± 1% on the total weight of cementitious material, for each material draw weight.

E. Compressive Strength Determination. Achieve an average 28-day compressive strength of 3600 psi, or greater, with no individual cylinder compressive strength less than 3000 psi.

F. Density Determination. Produce concrete with an average dry unit weight ranging from 110 to 115 lb/ft³ when tested in accordance with ASTM C567.

CONSTRUCTION DETAILS. Apply the provisions of §557-3 and the following modifications:

A. Concrete Manufacturing and Transporting. Add the following to §557-3.01:

1. Use slump, unit weight and air tests as a control measure to maintain a suitable consistency. Perform slump, unit weight and air tests according to Materials Method 9.2. Determine air content by the volumetric method (roll-a- meter) as described in ASTM C173. Air content and slump placement limits are:

	Minimum	Desired	Maximum
Air Content (%)	5.0	6.5	8.0
Slump (inches)	$2\ ^{1}/_{2}$	3-5	5

ITEM 557.01040018 - LIGHTWEIGHT, HIGH - PERFORMANCE SUPERSTRUCTURE SLAB WITH INTEGRAL WEARING SURFACE - BOTTOM FORMWORK REQUIRED

ITEM 557.05040018 - LIGHTWEIGHT, HIGH - PERFORMANCE SUPERSTRUCTURE SLAB WITH INTEGRAL WEARING SURFACE - BOTTOM FORMWORK NOT REQUIRED

ITEM 557.07040018 - LIGHTWEIGHT, HIGH - PERFORMANCE SUPERSTRUCTURE SLAB WITH SEPARATE WEARING SURFACE - BOTTOM FORMWORK REQUIRED

ITEM 557.09040018 - LIGHTWEIGHT, HIGH - PERFORMANCE SUPERSTRUCTURE SLAB WITH SEPARATE WEARING SURFACE - BOTTOM FORMWORK NOT REQUIRED

2. If the lightweight coarse aggregate moisture content at the time of batching is less than saturated surface dry (SSD), introduce the coarse aggregate, along with approximately ⅔ of the total mixing water, into the mixer and mix for a minimum of 10 minutes, then continue batching the remaining ingredients. If the coarse aggregate is in an SSD condition, batch the coarse aggregate routinely with the fine aggregate, admixtures, cement, fly ash (or GGBFS), microsilica, and mixing water, then mix completely.

3. Have the lightweight aggregate manufacturer supply a service representative at the site for the first two days of concrete placement operations to assist in the control of lightweight concrete mixing and placement.

B. Handling, Placing and Finishing. Handle and place concrete according to §557-3.05, except that pumping is not permitted. When an integral wearing surface is required, finish the concrete according to 557- 3.07. If the concrete will be overlaid with a separate wearing surface, finish the surface according to 557-3.09.

C. Testing. Test the concrete according to Materials Method 9.2. The unit mass of the fresh concrete during placement should be compared to that which was submitted with trial mix design. Make adjustments to the concrete mix at the batching facility based on slump, unit weight and air tests. The Engineer will cast cylinders, in sets of 2 individual cylinders, at a frequency of 1 set for each 50 yd^3, or fraction thereof actually placed. A minimum of 1 set will represent each day's concrete placement.

D. Curing. Cure the concrete according to §557-3.11, except that only continuous wetting is allowed. In cold weather, the provisions of §557-3.12 shall apply.

E. Repairs. Make any repairs as per the provisions of §557-3.16. Proposed repairs require Deputy Chief Engineer, Structures approval.

F. Rejection of Concrete. The Engineer will reject any concrete represented by a 28-day cylinder set with an average compressive strength less than 3600 psi, or an individual cylinder with a compressive strength less than 3000 psi.

G. Loading Limitations. The loading limitations of §557-3.14 apply, except that concrete cylinder sets designated for early loading must attain an average compression strength of 3600 psi, or greater, with no individual cylinder less than 3000 psi.

METHOD OF MEASUREMENT. Apply all of the provisions of §557-4.

BASIS OF PAYMENT. Apply all of the provisions of §557-5.

ITEM 557.22030016 - FIELD CAST UHPC CLOSURE POURS (LENGTH)
ITEM 557.22040016 - FIELD CAST UHPC CLOSURE POURS (VOLUME)

SCOPE

This specification covers field casting Ultra High Performance Concrete (UHPC). The maturity method is preferred to estimate the in-place UHPC strength. The time required before removal of the forms and loading of the structure will be determined based on the estimated in-place UHPC strength.

MATERIAL

High Molecular Weight Methacrylate (used as seal for closure pour)
The high molecular weight methacrylate (HMWM) resin shall be low viscosity and non-fuming. Acceptance is based on the manufacturer certifying that it conforms to the following, and the contractor forwarding the certification to the DCES:

Viscosity	Less than 25 cps when measured according to ASTM D2849
Density	Greater than 8.4 lb/gal. @ 77º F.
Flash Point	Greater than 200º F.
Vapor Pressure	Less than 1.0 mm Hg @ 77º F. (ASTM D 323)
TG (DSC)	Greater than 136º F (ASTM D3418)
Gel Time	Greater than 40 minutes for a 100 gram mass
Percent Solids	Greater than 90 % by weight
Bond Strength	Greater than 1522.3 psi (ASTM C882)

The sand shall be commercial quality dry blast sand. 95% of the sand shall pass the #8 sieve, and 95% shall be retained on the #30 sieve.

The container shall include the following information: The name of the manufacturer, the brand name of the product, the date of manufacture.

Water shall meet the requirements of §712-01.

UHPC
Material shall consist of:
Fine aggregate
Cementitious material
Super plasticizer
Accelerator
Steel Fibers, deformed, specifically made for steel reinforcement (2% minimum, by volume)

Physical properties shall meet the following:
Minimum Compressive Strength (ASTM C39)

High Heat-Treated*		25 ksi
Medium Heat-Treated**	12 hours	12 ksi
Not Heat-Treated***	3 day	12 ksi
Not Heat-Treated***	28 day	18 ksi

* Heat-Treated - According to manufacturer's recommendation, temperature not to exceed 250ºF.
** Medium Heat-Treated – Temperature not to exceed 120ºF
*** Not Heat-Treated - Cured at a temperature of 70° F ± 3°.

Prism Flexural Tensile toughness (ASTM C1018; 10 in. span)	$I_{30} \geq 48$
Long-Term Shrinkage (ASTM C157; initial reading after set)	$\leq$ 766 microstrain
Chloride Ion Penetrability (ASTM C1202)	$\leq$ 250 coulombs
Chloride Ion Penetrability (AASHTO T259; 1/5 in. depth)	< 0.07 oz/ft^3
Scaling Resistance (ASTM C672)	$y < 3$
Abrasion Resistance (ASTM C944 2x weight; ground surface)	< 0.025 oz. lost
Freeze-Thaw Resistance (ASTM C666A; 600 cycles)	RDM > 96%
Alkali-Silica Reaction (ASTM C1260; tested for 28 days)	Innocuous

Equipment for Maturity Testing
Use a Maturity Meter and thermocouples that can:

- Provide a maturity value based on the Equivalent Age or Temperature Time Method as detailed in ASTM C 1074-11.
- Continuously log and store maturity data.
- Accurate to within 1ºF when the meter is calibrated per the manufacturer's instructions.
- Take readings every half hour for the first 48 hours and every hour after that at a minimum.
- Print data and/or download it into a spreadsheet.

Methodology for Maturity Testing
The procedure for utilizing the maturity method to determine in-place UHPC strengths includes three steps: development of the strength-maturity relationship, monitoring the maturity of the placement, and regular validation of the strength maturity relationship. Any changes in the mix design, its components, or proportions will require that a new strength-maturity relationship be developed.

The strength-maturity relationship shall be developed one month prior to construction. Continue data collection for the strength-maturity relationship after acceptance of the maturity value until the strength reaches 18 ksi.

A procedure to develop the strength-maturity relationship shall be submitted to the DCES for review and approval along with the shop drawings. The submitted procedure shall include all necessary information for the development of the strength maturity relationship. All necessary testing included in the procedure shall be conducted by an AASHTO accredited testing lab.

CONSTRUCTION DETAILS

Installation Drawings
The proposed method of mixing, placing, and curing the UHPC closure pours shall be shown on the installation drawings. The Contractor shall perform qualification testing using maturity method and the results shall be shown on the installation drawing to demonstrate that the proposed method of curing will achieve the required strength at the required time.

Pre-Pour Meeting
Prior to the initial placement of the UHPC, the contractor shall arrange for an on site meeting with the UHPC representative. The contractor's staff and the NYSDOT Engineer and Inspectors shall attend the site meeting. The objective of the meeting will be to clearly outline the procedures for mixing, transporting, finishing and curing of the UHPC material.

ITEM 557.22030016 - FIELD CAST UHPC CLOSURE POURS (LENGTH)
ITEM 557.22040016 - FIELD CAST UHPC CLOSURE POURS (VOLUME)

The contractor shall arrange for a representative of the UHPC supplier to be on site during the placement of the closure pours. The representative shall be knowledgeable in the supply, mixing, delivery, placement, and curing of the UHPC material.

Storage
The contractor shall assure the proper storage of premix, fibers and additives as required by the supplier's specifications in order to protect materials against loss of physical and mechanical properties.

Form Work, Batching and Curing
The design and fabrication of forms shall follow approved installation drawings and shall follow the recommendations of the manufacturer. All the forms for UHPC shall be constructed from plywood. The forms shall be coated to prevent absorption of water.

The contractor shall follow the batching sequence as specified by the supplier and approved by the DCES. The UHPC closure pours shall be filled to 1/4 inch above the deck surface.

The UHPC in the form shall be cured per Manufacturer's recommendations to attain the required strength shown on the contract documents.

Quality Control
The contractor shall measure the slump flow on each batch of UHPC. The slump flow will be conducted using a mini-slump cone. The flow for each batch shall be between 7 in. and 10 in. The slump flow for each batch shall be recorded in the QA/QC log. A copy of the log shall be given to the Engineer.

The contractor shall make four sets of compressive strength test samples for each day of placement. Each set consists of 3 cylinders 3inches. X 6 inches. All sets shall be cured in an environment similar to the material they represent.

Estimation of In Place Strength
Compressive strengths shall be per the maturity method or ASTM C 39. The Contract Documents may contain requirements for specific strengths to achieve construction requirements such as carrying construction loads or opening to traffic. Break cylinders or follow maturity procedures to verify these intermediate strengths and to determine final strengths.

Maturity Method
Two thermocouples per each UHPC closure pour, one at each end, shall be installed. The locations of these installations shall be shown on the installation drawings. These locations shall be revised if directed by the DCES. The thermocouple wiring may be connected to reinforcing steel, but probe endings may not be in direct contact with the steel. Consider structural or exposure conditions when placing thermocouples.

Listed actions are allowed when the maturity value of all the thermocouples reaches the corresponding strength values listed below.

Action	**Strength Requirement**
Removal of top forms	10 ksi
Open Bridge deck to Traffic	12 ksi

Record and save the maturity data from the meter until the strength reaches 18 ksi. Disconnect the meter and clip all wires flush with the concrete surface.

A continuous read thermocouple or thermistor with a data logger can be used to estimate in place strength. The methodology outlined in ASTM C 1074 11 will be used. The maturity function used to estimate strength will be calculated with the same formula that is used by the maturity meter that established the initial strength maturity relationship. Copies of the calculations will be provided to the engineer.

Validation of the Strength Maturity Relationship
For each day of placement, perform validation tests by casting 7 cylinders. Equip one of the cylinders with a thermocouple. Test the cylinders as close as possible to the maturity value corresponding to 18 ksi. Record the maturity value immediately prior to testing. All testing shall be conducted by an AASHTO accredited testing lab. Report the results to the DCES.

If the average value of compressive strength of each pair of cylinders is within 10% of the estimated value, the strength maturity relationship will be validated. If the average cylinder value is more than 10% below the estimated value, the strength maturity relationship will need to be re established. If the first four cylinders produce acceptable results, the remainder need not be tested.

The Department may perform additional testing for research purposes. Casting and testing in addition to that required in this spec will be performed by NYSDOT personnel.

In case of loss of required data, or non-verification of the strength maturity relationship, use the cylinders cast above, one pair at a time, to verify the strength.

Surface Finishing
After the joint has set and before it is sealed, the UHPC joint shall be ground smooth to be flush with the adjacent surfaces.

Closure pour Sealing and Watertight Integrity Test
The Contractor may seal the closure pour using HMWM, or may use the following procedure to prove the closure pour does not leak.

After the closure pour has reached the required strength, a watertight integrity test shall be performed in accordance with §567-3.01.H. If leakage occurs the Contractor must seal the entire length of the leaking closure pour using HMWM at no extra cost to the State.

If a rain event occurs that meets the requirements of §567-3.01.H, the Contractor may elect to perform the watertight integrity test using the rain as the water supply.

Sealing the Closure Pour
Abrasive blast clean the area to be treated, removing all contaminants from the surface. Clean adjacent surfaces of the closure pours using compressed air which is free of oil and moisture.

Do not apply sealers if rain is expected within 12 hours of completion. Apply sealers to clean, dry surfaces when the surface temperature is at least 50º F, and if near 50º F, rising. The sealer shall be mixed and applied according to the manufacturer's instructions and no more than 5 gallons at a time. Pour the sealer over the closure pours.

When the methacrylate surface will be used as a driving surface, sand must be applied to provide friction. After the resin has been applied, at least 20 minutes shall elapse before applying the sand. The sand shall be broadcast at a rate of approximately two pounds per square yard, completely covering the sealer.

The sealer must be tack-free before construction traffic is permitted to resume.

MEASUREMENT FOR PAYMENT

Length: Measurement will be by length of UHPC closure pours placed in feet. The length of in-place UHPC shall be calculated to the nearest foot.

Volume: Measurement will be by volume of UHPC closure pours placed in cubic feet. The volume of in-place UHPC shall be calculated to the nearest cubic foot.

BASIS OF PAYMENT

Payment at the contract price for the above item shall be full compensation for all labor, equipment, and material to do the work.

ITEM 557.2500NN16 - CRACK SEALING USING HIGH MOLECULAR WEIGHT METHACRYLATE – LINEAR CRACKS

DESCRIPTION

This work shall consist of furnishing and installing Crack Sealing Using High Molecular Weight Methacrylate in accordance with the contract documents and as directed by the Engineer.

MATERIALS

The high molecular weight methacrylate (HMWM) resin shall be low viscosity and non-fuming. Acceptance is based on the manufacturer certifying that it conforms to the following, and the contractor forwarding the certification to the DCES:

Viscosity	Less than 25 cps when measured according to ASTM D2849
Density	Greater than 8.4 lb/gal. @ 77º F.
Flash Point	Greater than 200º F.
Vapor Pressure	Less than 1.0 mm Hg @ 77º F. (ASTM D 323)
TG (DSC)	Greater than 136º F (ASTM D3418)
Gel Time	Greater than 40 minutes for 3.5 ounces
Percent Solids	Greater than 90 % by weight
Bond Strength	Greater than 1522.3 psi (ASTM C882)

Sand The sand shall be commercial quality dry blast sand. 95% of the sand shall pass the #8 sieve, and 95% shall be retained on the #30 sieve.

The container shall include the following information: The name of the manufacturer, the brand name of the product, the date of manufacture.

CONSTRUCTION DETAILS

Abrasive blast clean the area to be treated, removing all contaminants from the surface. Clean all surfaces and cracks using compressed air which is free of oil and moisture.

Do not apply sealers if rain is expected within 12 hours of completion. Apply sealers to clean, dry surfaces when the surface temperature is at least 50º F, and if near 50º F, rising. The sealer shall be mixed and applied according to the manufacturer's instructions and no more than 5 gallons at a time. Pour sealer into the cracks.

After the resin has been applied, at least 20 minutes shall elapse before applying the sand. The sand shall be broadcast at a rate of approximately two pounds per square yard, completely covering the sealer.

The sealer must be tack-free before traffic is permitted to resume.

METHOD OF MEASUREMENT

This work will be measured as the number of feet of Crack Sealing Using High Molecular Weight Methacrylate satisfactorily furnished and installed.

BASIS OF PAYMENT

The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work.

ITEM 557.2600NN16 - CRACK SEALING USING HIGH MOLECULAR WEIGHT METHACRYLATE - FLOODING

DESCRIPTION

This work shall consist of furnishing and installing Crack Sealing Using High Molecular Weight Methacrylate in accordance with the contract documents and as directed by the Engineer.

MATERIALS

The high molecular weight methacrylate (HMWM) resin shall be low viscosity and non-fuming. Acceptance is based on the manufacturer certifying that it conforms to the following, and the contractor forwarding the certification to the DCES:

Viscosity	Less than 25 cps when measured according to ASTM D2849
Density	Greater than 8.4 lb/gal. @ 77º F.
Flash Point	Greater than 200º F.
Vapor Pressure	Less than 1.0 mm Hg @ 77º F. (ASTM D 323)
TG (DSC)	Greater than 136º F (ASTM D3418)
Gel Time	Greater than 40 minutes for a 100 gram mass
Percent Solids	Greater than 90 % by weight
Bond Strength	Greater than 1522.3 psi (ASTM C882)

Sand The sand shall be commercial quality dry blast sand. 95% of the sand shall pass the #8 sieve, and 95% shall be retained on the #30 sieve.

The container shall include the following information: The name of the manufacturer, the brand name of the product, the date of manufacture.

CONSTRUCTION DETAILS

Abrasive blast clean the area to be treated, removing all contaminants from the surface. Clean all surfaces and cracks using compressed air which is free of oil and moisture.

Do not apply sealers if rain is expected within 12 hours of completion. Apply sealers to clean, dry surfaces when the surface temperature is at least 50º F, and if near 50º F, rising. The sealer shall be mixed and applied according to the manufacturer's instructions and no more than 5 gal. at a time. Sweep, pour, squeegee, or spray the area to receive the sealers, allowing the sealers to flow into the cracks. If the manufacturer does not recommend an application rate, use 8.5 to 11.8 square yards per gallon, as needed.

After the resin has been applied, at least 20 minutes shall elapse before applying the sand. The sand shall be broadcast at a rate of approximately two pounds per square yard, completely covering the sealer.

The sealer must be tack-free before traffic is permitted to resume.

METHOD OF MEASUREMENT

This work will be measured as the number of square yards of Crack Sealing Using High Molecular Weight Methacrylate satisfactorily furnished and installed.

BASIS OF PAYMENT

The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work.

ITEM 557.6401XX03 - PRECAST CONCRETE DECK - TYPE XX FRICTION
ITEM 557.6403XX03 - PRECAST CONCRETE APPROACH SLAB - TYPE XX FRICTION
ITEM 557.11010003 - INTEGRAL PRECAST CONCRETE BARRIER

DESCRIPTION.

Furnish and place precast concrete deck, precast concrete approach slab and integral precast concrete barrier with ultra high performance concrete (UHPC) joints. The maturity method shall be used to estimate the in-place UHPC strength. The time required before removal of the forms and loading of the structure will be determined based on the estimated in-place UHPC strength. "Panels" refers to both the concrete deck and to the approach slab.

XX = Friction Type
- 01 - Type 1 Friction
- 02 - Type 2 Friction
- 03 - Type 3 Friction
- 09 - Type 9 Friction

MATERIALS

PRECAST CONCRETE PANELS: Materials used in this work shall conform to the NYSDOT Prestressed Concrete Construction Manual (PCCM)-Current Edition and the following:

STEEL EMBEDMENTS. Steel embedments for the panel leveling devices and hold down devices shall be installed in the shop based upon the locations shown on the shop drawings.

Leveling Bolts	ASTM F568M, Class 4.6

CONCRETE

28 Day Compressive Strength	5000 psi	(Minimum)
Lifting Strength	3000 psi	(Minimum)
Epoxy Coated Bar Reinforcement	709-04	
Stainless Steel Bar Reinforcement	709-13	
Mechanical Connectors	709-10	
Water	§712-01	
Aggregates (Friction Type)	501-202.B	

PRECAST CONCRETE APPROACH SLAB

The supplier must demonstrate a system to place the approach slab using a grout bed such that the approach slab is fully supported at the proper line and grade.

HIGH WEIGHT METHYL METHACRYLATE (used as repair for leaking joint)

The high molecular weight methacrylate (HMWM) resin shall be low viscosity and non-fuming. Acceptance is based on the manufacturer certifying that it conforms to the following, and the contractor forwarding the certification to the DCES:

Viscosity	Less than 25 cps when measured according to ASTM D2849
Density	Greater than 8.4 lb/gal. @ 77º F.
Flash Point	Greater than 200º F.
Vapor Pressure	Less than 1.0 mm Hg @ 77º F. (ASTM D 323)
TG (DSC)	Greater than 136º F (ASTM D3418)
Gel Time	Greater than 40 minutes for a 100 gram mass
Percent Solids	Greater than 90 % by weight

Bond Strength Greater than 1522.3 psi (ASTM C882)

Sand The sand shall be commercial quality dry blast sand. 95% of the sand shall pass the #8 sieve, and 95% shall be retained on the #30 sieve.

The container shall include the following information:

The name of the manufacturer
the brand name of the product
the date of manufacture.

INTEGRAL PRECAST CONCRETE BARRIER: The requirements of the PCCM and the following shall apply.

Tolerances:

1)	Bar Reinforcement Cover	-0, + ½ inch
2)	Width of Unit at the top	-0, + ¼ inch
3)	Width of Unit at the bottom	-0, + ½ inch
4)	Surface deviation from theoretical centerline	½ inch in 20 feet
5)	Vertical Alignment (deviation from a line parallel to theoretical grade)	½ inch in 20 feet
6)	Horizontal and Vertical Alignment (between adjacent units)	3/16 inch

HAUNCH AND JOINT MATERIAL UHPC: The material shall be Ultra High Performance Concrete, all components supplied by one manufacturer. Materials commonly used in UHPC are:

Fine aggregate
Cementitious material
Super plasticizer
Accelerator
Steel Fibers

UHPC material shall meet the following, 28 days unless otherwise noted:

Minimum Compressive Strength (ASTM C39)	
High Heat-Treated*	≥ 25 ksi
Medium Heat-Treated 12 hours**	≥ 12 ksi
Not Heat-Treated 14 days***	≥ 21 ksi
Prism Flexural Tensile toughness (ASTM C1018; 12 in. span)	$I_{30} \geq 48$
Long-Term Shrinkage (ASTM C157; initial reading after set)	≤ 766 microstrain
Chloride Ion Penetrability (ASTM C1202)	≤ 250 coulombs
Chloride Ion Penetrability (AASHTO T259; ½ in. depth)	< 0.07 oz/ft^3
Scaling Resistance (ASTM C672)	y < 3
Abrasion Resistance (ASTM C944 2x weight; ground surface)	< 0.025 oz. lost
Freeze-Thaw Resistance (ASTM C666A; 600 cycles)	RDM > 96%
Alkali-Silica Reaction (ASTM C1260; tested for 28 days)	Innocuous

* High Heat-Treated - According to manufacturer's recommendation, temperature not to exceed 250ºF.
** Medium Heat Treated temperatures not to exceed 120ºF
*** Not Heat Treated temperature not to exceed 70ºF

Results of all the tests above, conducted by an AASHTO accredited testing lab shall be submitted to the DCES along with the installation drawings. Provide to the DCES a list of bridge projects in which the proposed UHPC material has been used as joint fill between precast concrete elements (within or outside

the USA). The DCES reserves the right to reject a proposed UHPC material which lacks a proven track record in precast concrete joint filling in bridge applications.

Storage: The contractor shall assure the proper storage of premix, fibers and additives as required by the supplier's specifications in order to protect materials against loss of physical and mechanical properties.

Acceptance Testing: Note: acceptance testing will be waived if the same material from the same supplier has already been tested according to this standard. The Contractor shall complete the testing of the UHPC a minimum of one month before placement of the joint. The testing sequence will include the submission of a plan for casting and testing procedures to the DCES for review and approval followed by casting and testing according to the approved plan.

Casting and testing must include the following:

A minimum of 12 cylinders 3in. x 6 in. shall be cast.

The temperature during curing shall be as per heat treatment temperature limits established in this specification. 2 cylinders shall be tested each testing interval. Testing intervals are at 10 hours, 12 hours, 14 hours, and 24 hours. The compressive strength shall be measured by ASTM C39. Only a concrete mix design that passes these tests may be used to form the joint.

> Pullout Test: Cast 6 additional cylinders 12 in. diameter and 7.5 in. deep. Each cylinder shall have one 32 in. long epoxy-coated reinforcing bar cast in the center of the circular face. The axis of the bar shall be perpendicular to the formed surface. 3 of the bars shall be #6 bars embedded 5 in. deep and 3 of the bars shall be #4 bars embedded 3 in. deep. These cylinders will be kept wet for four days then delivered to the Materials Bureau for testing according to Test Method No. NY 701-14 E. Contact the Materials Bureau prior to casting for specific instructions on preparing the test specimens. The test will be performed as soon as practical after the corresponding compressive strength samples reach 12 ksi. Acceptance criteria for pullout testing shall be when there is complete tensile failure of the reinforcing bar, prior to pullout from the concrete or failure of the concrete.

EQUIPMENT FOR MATURITY TESTING:

Use a Maturity Meter and thermocouples that can:

- Provide a maturity value based on the Equivalent Age or Temperature Time Method as detailed in ASTM C 1074-11.
- Continuously log and store maturity data.
- Accurate to within +/- 1° F when the meter is calibrated as per the manufacturer=s instructions.
- Take readings every half hour for the first 48 hours and every hour after that at a minimum.
- Print data and/or download it into a spreadsheet.

METHODOLOGY FOR MATURITY TESTING:

The procedure for utilizing the maturity method to determine in-place UHPC strengths includes three steps: development of the strength-maturity relationship, monitoring the maturity of the placement, and regular validation of the strength maturity relationship. Any changes in the mix design, its components,

or proportions will require that a new strength-maturity relationship be developed.
The strength-maturity relationship shall be developed one month prior to construction. Continue data collection for the strength-maturity relationship after acceptance of the maturity value until the strength reaches 21 ksi.

A procedure to develop the strength-maturity relationship shall be submitted to the DCES for review and approval along with the shop drawings. The submitted procedure shall include all necessary information for the development of the strength maturity relationship. All necessary testing included in the procedure shall be conducted by an AAHSTO accredited testing lab.

CONSTRUCTION

DRAWINGS FOR PRECAST CONCRETE PANELS AND BARRIER

Shop drawings and installation drawings shall be prepared and submitted as per the requirements of the Prestressed Concrete Construction Manual, (PCCM), and the following:
The submitted drawings shall include details of lifting and handling of panels in the production facility and their storage, transportation, handling and storage at the construction site. Lifting holes and hardware will not be permitted on the top of the slab. The proposed handling and lifting shall be such that the maximum tensile stress in concrete due to handling and erection loads shall not exceed $0.15(f'_{ci})^{1/2}$,where $f'ci$ is the concrete compressive strength at the time being considered. Calculations showing actual concrete stresses based upon the proposed support locations and expected dynamic loading of the panels during handling, storage and transportation of the panels shall be prepared by a Professional Engineer and shall be submitted along with the drawings. These drawings and calculations shall be stamped and signed by a Professional Engineer.

Integral precast concrete barrier shall be cast integrally with the precast concrete deck prior to shipping. Proposed procedures for the casting, handling, and shipping shall be included in the drawings for the precast concrete panels.

The proposed method of mixing, placing, and curing the UHPC joints shall be shown on the installation drawings. The Contractor shall perform qualification testing using maturity method and the results shall be shown on the installation drawing to demonstrate that the proposed method of curing will achieve the required strength at the required time.

FABRICATION OF PRECAST CONCRETE PANELS

Fabrication shall meet the requirements of the PCCM and the following:

Fabrication Tolerances

1. Width (transverse direction of the bridge): +1/8, -1/8 in.
2. Length (longitudinal direction of the bridge): +1/8, -1/8 in.
3. Depth (overall): +1/8, -0 in.
4. Bulkhead alignment (deviation from square or designated skew)
   - Vertical ¼ in.
   - Horizontal ¼ in.
5. Horizontal alignment (deviation from straight line parallel to centerline of unit):
   - ¼ in. for 40 ft length
   - 3/8 in. for 40 ft to 60 ft length
   - 1/2 in. for greater than 60 ft length

ITEM 557.6401XX03 - PRECAST CONCRETE DECK - TYPE XX FRICTION
ITEM 557.6403XX03 - PRECAST CONCRETE APPROACH SLAB - TYPE XX FRICTION
ITEM 557.11010003 - INTEGRAL PRECAST CONCRETE BARRIER

Welding of steel shall comply with the requirements of the New York State Steel Construction Manual.

Placing Concrete, Curing and Finishing
All requirements stipulated in PCCM shall apply except for the following:
After curing, all form release material and all other forming material adhering to the shear keyway and block out concrete shall be removed. Shear key faces shall be roughened and blast cleaned.

Shipping and Handling of Precast Panels and Precast Concrete Barrier. Shall be as per approved drawings.

Loading of Panels. Equipment weighing more than 2500 pounds shall not be permitted on the precast units between the initial set of the UHPC and the time the UHPC has reached a minimum strength of 10 ksi.

Mixing and Placing UHPC Joints and Haunches. Specifications in the PCCM and the following:

Thoroughly and continuously wet the concrete contact area for 24 hours prior the placing of UHPC, keep wet and remove all surface water just prior to UHPC placement.

INSTALLATION REQUIREMENTS FOR DECK SLABS
Installation shall meet the requirements of the PCCM and the following:

1. Prior to installing panels, the supporting steel surfaces in contact with the panels or field placed concrete shall be cleaned, including removal of free water, to the satisfaction of the engineer.

2. Installation tolerances shall be as per the approved installation drawings. It is the responsibility of the contractor to develop appropriate controls during the fabrication and installation of the panels so that proper cross slopes and grades are achieved after the diamond grinding operation. Installation drawing shall show the details of the proposed controls.

INSTALLATION REQUIREMENTS FOR APPROACH SLABS

Bed and level slabs in accordance with the system designer's instructions such that the vertical differential across any joint is ¼ in. or less. Slabs shall be placed on grade and have grout pumped underneath to ensure that they are completely supported.

INSTALLATION REQUIREMENTS FOR UHPC
The contractor shall arrange for a representative of the UHPC supplier to be on site during the placement of the joints until the Contractor's own staff has become well-trained in the use of the material. The representative shall be knowledgeable in the supply, mixing, delivery, placement, and curing of the UHPC material.

UHPC placement shall meet the requirements of the PCCM. Details of vent and fill ports, shall be shown on the installation drawing. Required QC for the grouting also shall be listed on the drawings.

INSTALLATION REQUIREMENTS FOR DIAMOND GRINDING.
The depth of the grinding shall be a minimum of ¼" in order to obtain proper cross slopes and grades.

Begin and end diamond grinding lines normal to the bridge deck centerline. Grind the bridge deck longitudinally such that at least 95% of the bridge deck surface is ground and the bridge deck is in the same plane across a joint or crack when measured with a 3 foot straightedge. Provide surface drainage by maintaining the proper cross-slope on the finished surface and by blending adjacent passes. Regrind the bridge deck if an acceptable surface is not being obtained. Continuously remove slurry from the bridge deck using the vacuum system on the grinding equipment. If required, provide equipment capable of transporting the slurry from the job site without spilling.

PRE-INSTALLATION MEETING: Convene a preplacement meeting 7 to 14 calendar days before the planned start of slab installation. The contractor shall arrange for an on site meeting with representatives from the UHPC and the precast system suppliers. The contractor's staff and the NYSDOT Engineer and Inspectors shall attend the site meeting. The objective of the meeting will be to clearly outline the procedures for placing and leveling the precast concrete panels and for mixing, transporting, finishing and curing of the UHPC material.

Form Work, Batching and Curing
The design and fabrication of forms shall follow approved installation drawings and shall follow the recommendations of the manufacturer. All the forms for UHPC shall be constructed from plywood or approved equal. The forms shall be coated to prevent absorption of water using a form release agent from the Department's Approved List of Materials.

The contractor shall follow the batching sequence as specified by the supplier and approved by the DCES. The surface of the UHPC field joints shall be filled to plus ¼ inch above the precast panels.

The UHPC in the form shall be cured according to Manufacturer's recommendations to attain the required strength shown on the contract documents.

Quality Control

The contractor shall measure the slump flow on each batch of UHPC. The slump flow will be conducted using a mini-slump cone. The flow for each batch shall be between 7 in. and 10 in. The slump flow for each batch shall be recorded in the QA/QC log. A copy of the log shall be given to the Engineer.

Estimation of In-Place Strength:

1. Two thermocouples per each UHPC joints, one at each end, shall be installed. The locations of these installations shall be shown on the installation drawings. These locations shall be revised if directed by the DCES. The thermocouple wiring may be connected to reinforcing steel, but probe endings may not be in direct contact with the steel. Consider structural or exposure conditions when placing thermocouples.

2. Listed actions are allowed when the maturity value of all the thermocouples reaches the corresponding strength values listed below.

Action	Strength Requirement
Removal of top forms	10 ksi
Open Bridge deck to Traffic	12 ksi

3. Record and save the maturity data from the meter until the strength reaches 21 ksi.

Disconnect the meter and clip all wires flush with the concrete surface.

A continuous read thermocouple or thermistor with a data logger can be used to estimate in place strength. The methodology outlined in ASTM C 1074-11 will be used. The maturity function used to estimate strength will be calculated with the same formula that is used by the maturity meter that established the initial strength maturity relationship. Copies of the calculations will be provided to the engineer.

Validation of the Strength-Maturity Relationship:
For each day of placement, perform validation tests by casting 7 cylinders. Equip one of the cylinders with a thermocouple. Test the cylinders as close as possible to the maturity value corresponding to 21 ksi. Record the maturity value immediately prior to testing. All testing shall be conducted by an AASHTO accredited testing lab. Report the results to the DCES.
If the average value of compressive strength of each pair of cylinders is within 10% of the estimated value, the strength-maturity relationship will be validated. If the average cylinder value is more than 10% below the estimated value, the strength maturity relationship will need to be re-established. If the first four cylinders produce acceptable results, the remainder need not be tested.

The Department may perform additional testing for research purposes. Casting and testing in addition to that required in this spec will be performed by NYSDOT personnel.

In case of loss of required data, or non-verification of the strength-maturity relationship, use the cylinders cast above, one pair at a time, to verify the strength.

Watertight Integrity Test
After the joint has reached the required strength, a watertight integrity test shall be performed in accordance with §567-3.01.H. If leakage occurs the Contractor must seal the entire length of the leaking joint using High Weight Methyl Methacrylate at no extra cost to the State. The Contractor may elect to seal the joint using High Weight Methyl Methacrylate instead of performing the watertight integrity test.

If a rain event occurs that meets the requirements of §567-3.01.H, the Contractor may elect to perform the watertight integrity test using the rain as the water supply.

Repair
Abrasive blast clean the area to be treated, removing all contaminants from the surface. Clean adjacent surfaces of the leaking joints using compressed air which is free of oil and moisture.

Do not apply sealers if rain is expected within 12 hours of completion. Apply sealers to clean, dry surfaces when the surface temperature is at least 50º F, and if near 50º F, rising. The sealer shall be mixed and applied according to the manufacturer's instructions and no more than 5 gallons at a time. Pour the sealer over the joints.

METHOD OF MEASUREMENT. For precast concrete bridge decks and precast concrete approach slabs apply all the provisions of §557-4. For precast concrete bridge barrier apply all the provisions of §569-4.

BASIS OF PAYMENT. For precast concrete bridge decks and precast concrete approach slabs apply all the provisions of §557-5. For precast concrete bridge barrier apply all the provisions of §569-5.

ITEM 557.6401XX03 - PRECAST CONCRETE DECK - TYPE XX FRICTION
ITEM 557.6403XX03 - PRECAST CONCRETE APPROACH SLAB - TYPE XX FRICTION
ITEM 557.11010003 - INTEGRAL PRECAST CONCRETE BARRIER

ITEM 557.6401XX03 - PRECAST CONCRETE DECK - TYPE XX FRICTION
ITEM 557.6403XX03 - PRECAST CONCRETE APPROACH SLAB - TYPE XX FRICTION
ITEM 557.11010003 - INTEGRAL PRECAST CONCRETE BARRIER

DESCRIPTION.

Furnish and place precast concrete deck, precast concrete approach slab and integral precast concrete barrier with ultra high performance concrete (UHPC) joints. The maturity method shall be used to estimate the in-place UHPC strength. The time required before removal of the forms and loading of the structure will be determined based on the estimated in-place UHPC strength. "Panels" refers to both the concrete deck and to the approach slab.

XX = Friction Type
- 01 - Type 1 Friction
- 02 - Type 2 Friction
- 03 - Type 3 Friction
- 09 - Type 9 Friction

MATERIALS

PRECAST CONCRETE PANELS: Materials used in this work shall conform to the NYSDOT Prestressed Concrete Construction Manual (PCCM)-Current Edition and the following:

STEEL EMBEDMENTS. Steel embedments for the panel leveling devices and hold down devices shall be installed in the shop based upon the locations shown on the shop drawings.

Leveling Bolts	ASTM F568M, Class 4.6

CONCRETE

28 Day Compressive Strength	5000 psi	(Minimum)
Lifting Strength	3000 psi	(Minimum)
Epoxy Coated Bar Reinforcement	709-04	
Mechanical Connectors	709-10	
Water	§712-01	
Aggregates (Friction Type)	501-202.B	

PRECAST CONCRETE APPROACH SLAB

The supplier must demonstrate a system to place the approach slab using a grout bed such that the approach slab is fully supported at the proper line and grade.

INTEGRAL PRECAST CONCRETE BARRIER: The requirements of the PCCM and the following shall apply.

Tolerances:

1)	Bar Reinforcement Cover	-0, + ½ inch
2)	Width of Unit at the top	-0, + ¼ inch
3)	Width of Unit at the bottom	-0, + ½ inch
4)	Surface deviation from theoretical centerline	½ inch in 20 feet
5)	Vertical Alignment (deviation from a line parallel to theoretical grade)	½ inch in 20 feet
6)	Horizontal and Vertical Alignment (between adjacent units)	3/16 inch

ITEM 557.6401XX03 - PRECAST CONCRETE DECK - TYPE XX FRICTION
ITEM 557.6403XX03 - PRECAST CONCRETE APPROACH SLAB - TYPE XX FRICTION
ITEM 557.11010003 - INTEGRAL PRECAST CONCRETE BARRIER

JOINT MATERIAL UHPC: The material shall be Ultra High Performance Concrete, all components supplied by one manufacturer. Materials commonly used in UHPC are:

Fine aggregate
Cementitious material
Super plasticizer
Accelerator
Steel Fibers

UHPC material shall meet the following, 28 days unless otherwise noted:

Minimum Compressive Strength (ASTM C39)	
High Heat-Treated*	≥ 25 ksi
Medium Heat-Treated 12 hours**	≥ 12 ksi
Not Heat-Treated 14 days***	≥ 21 ksi
Prism Flexural Tensile toughness (ASTM C1018; 12 in. span)	$I_{30} \geq 48$
Long-Term Shrinkage (ASTM C157; initial reading after set)	≤ 766 microstrain
Chloride Ion Penetrability (ASTM C1202)	≤ 250 coulombs
Chloride Ion Penetrability (AASHTO T259; ½ in. depth)	< 0.07 oz/ft^3
Scaling Resistance (ASTM C672)	y < 3
Abrasion Resistance (ASTM C944 2x weight; ground surface)	< 0.025 oz. lost
Freeze-Thaw Resistance (ASTM C666A; 600 cycles)	RDM > 96%
Alkali-Silica Reaction (ASTM C1260; tested for 28 days)	Innocuous

* High Heat-Treated - According to manufacturer's recommendation, temperature not to exceed 250ºF.
** Medium Heat Treated temperatures not to exceed 120ºF
*** Not Heat Treated temperature not to exceed 70ºF
Results of all the tests above, conducted by an AASHTO accredited testing lab shall be submitted to the DCES along with the installation drawings. Provide to the DCES a list of bridge projects in which the proposed UHPC material has been used as joint fill between precast concrete elements (within or outside the USA). The DCES reserves the right to reject a proposed UHPC material which lacks a proven track record in precast concrete joint filling in bridge applications.

Storage: The contractor shall assure the proper storage of premix, fibers and additives as required by the supplier's specifications in order to protect materials against loss of physical and mechanical properties.

Acceptance Testing: Note: acceptance testing will be waived if the same material from the same supplier has already been tested according to this standard. The Contractor shall complete the testing of the UHPC a minimum of one month before placement of the joint. The testing sequence will include the submission of a plan for casting and testing procedures to the DCES for review and approval followed by casting and testing according to the approved plan.

Casting and testing must include the following:

A minimum of 12 cylinders 3in. x 6 in. shall be cast.

The temperature during curing shall be as per heat treatment temperature limits established in this specification. 2 cylinders shall be tested each testing interval. Testing intervals are at 10 hours, 12 hours, 14 hours, and 24 hours. The compressive strength shall be measured by ASTM C39. Only a concrete mix design that passes these tests may be used to form the joint.

Pullout Test: Cast 6 additional cylinders 12 in. diameter and 7.5 in. deep. Each cylinder shall have one 32 in. long epoxy-coated reinforcing bar cast in the center of the circular face. The axis of the bar shall be perpendicular to the formed surface. 3 of the bars shall be #6 bars embedded 5 in. deep and 3 of the bars shall be #4 bars embedded 3 in. deep. These cylinders will be kept wet for four days then delivered to the Materials Bureau for testing according to Test Method No. NY 701-14 E. Contact the Materials Bureau prior to casting for specific instructions on preparing the test specimens. The test will be performed as soon as practical after the corresponding compressive strength samples reach 12 ksi. Acceptance criteria for pullout testing shall be when there is complete tensile failure of the reinforcing bar, prior to pullout from the concrete or failure of the concrete.

EQUIPMENT FOR MATURITY TESTING:

Use a Maturity Meter and thermocouples that can:

- $ Provide a maturity value based on the Equivalent Age or Temperature Time Method as detailed in ASTM C 1074-11.
- $ Continuously log and store maturity data.
- $ Accurate to within +/- 1° F when the meter is calibrated as per the manufacturer=s instructions.
- $ Take readings every half hour for the first 48 hours and every hour after that at a minimum.
- $ Print data and/or download it into a spreadsheet.

METHODOLOGY FOR MATURITY TESTING:

The procedure for utilizing the maturity method to determine in-place UHPC strengths includes three steps: development of the strength-maturity relationship, monitoring the maturity of the placement, and regular validation of the strength maturity relationship. Any changes in the mix design, its components, or proportions will require that a new strength-maturity relationship be developed.
The strength-maturity relationship shall be developed one month prior to construction. Continue data collection for the strength-maturity relationship after acceptance of the maturity value until the strength reaches 21 ksi.

A procedure to develop the strength-maturity relationship shall be submitted to the DCES for review and approval along with the shop drawings. The submitted procedure shall include all necessary information for the development of the strength maturity relationship. All necessary testing included in the procedure shall be conducted by an AAHSTO accredited testing lab.

CONSTRUCTION

DRAWINGS FOR PRECAST CONCRETE PANELS AND BARRIER

Shop drawings and installation drawings shall be prepared and submitted as per the requirements of the Prestressed Concrete Construction Manual, (PCCM), and the following:
The submitted drawings shall include details of lifting and handling of panels in the production facility and their storage, transportation, handling and storage at the construction site. Lifting holes will not be

permitted. The proposed handling and lifting shall be such that the maximum tensile stress in concrete due to handling and erection loads shall not exceed $0.15(f'_{ci})^{1/2}$, where *f'ci* is the concrete compressive strength at the time being considered. Calculations showing actual concrete stresses based upon the proposed support locations and expected dynamic loading of the panels during handling, storage and transportation of the panels shall be prepared by a Professional Engineer and shall be submitted along with the drawings. These drawings and calculations shall be stamped and signed by a Professional Engineer.

Integral precast concrete barrier shall be cast integrally with the precast concrete deck prior to shipping. Proposed procedures for the casting, handling, and shipping shall be included in the drawings for the precast concrete panels.

The proposed method of mixing, placing, and curing the UHPC joints shall be shown on the installation drawings. The Contractor shall perform qualification testing using maturity method and the results shall be shown on the installation drawing to demonstrate that the proposed method of curing will achieve the required strength at the required time.

FABRICATION OF PRECAST CONCRETE PANELS

Fabrication shall meet the requirements of the PCCM and the following:

Fabrication Tolerances

1. Width (transverse direction of the bridge): +1/8, -1/8 in.
2. Length (longitudinal direction of the bridge): +1/8, -1/8 in.
3. Depth (overall): +1/8, -0 in.
4. Bulkhead alignment (deviation from square or designated skew)
   - Vertical ¼ in.
   - Horizontal ¼ in.
5. Horizontal alignment (deviation from straight line parallel to centerline of unit):
   - ¼ in. for 40 ft length
   - 3/8 in. for 40 ft to 60 ft length
   - 1/2 in. for greater than 60 ft length

Welding of steel shall comply with the requirements of the New York State Steel Construction Manual.

Placing Concrete, Curing and Finishing

All requirements stipulated in PCCM shall apply except for the following:
After curing, all form release material and all other forming material adhering to the shear keyway and block out concrete shall be removed. Shear key faces shall be roughened and blast cleaned.

Shipping and Handling of Precast Panels and Precast Concrete Barrier. Shall be as per approved drawings.

Loading of Panels. Equipment weighing more than 2500 pounds shall not be permitted on the precast units between the initial set of the UHPC and the time the UHPC has reached a minimum strength of 10 ksi.

Mixing and Placing UHPC Joints and Haunches. Specifications in the PCCM and the following:

Thoroughly and continuously wet the concrete contact area for 24 hours prior the placing of UHPC, keep wet and remove all surface water just prior to UHPC placement.

INSTALLATION REQUIREMENTS FOR DECK SLABS

Installation shall meet the requirements of the PCCM and the following:

1. Prior to installing panels, the supporting steel surfaces in contact with the panels or field placed concrete shall be cleaned, including removal of free water, to the satisfaction of the engineer.

2. Installation tolerances shall be as per the approved installation drawings. It is the responsibility of the contractor to develop appropriate controls during the fabrication and installation of the panels so that proper cross slopes and grades are achieved after the diamond grinding operation. Installation drawing shall show the details of the proposed controls.

INSTALLATION REQUIREMENTS FOR APPROACH SLABS

Bed and level slabs in accordance with the system designer's instructions such that the vertical differential across any joint is ¼ in. or less. Slabs shall be placed on grade and have grout pumped underneath to ensure that they are completely supported.

INSTALLATION REQUIREMENTS FOR UHPC

The contractor shall arrange for a representative of the UHPC supplier to be on site during the placement of the joints until the Contractor's own staff has become well-trained in the use of the material. The representative shall be knowledgeable in the supply, mixing, delivery, placement, and curing of the UHPC material.

GROUTING OF HAUNCHES

Grouting shall meet the requirements of the PCCM, except that the requirement related to post-tensioning shall not apply. Details of grouting ports, vents, method of pumping the grout, equipment with necessary back up shall be shown on the installation drawing. Required QC for the grouting also shall be listed on the drawings.

PRE-INSTALLATION MEETING: Convene a preplacement meeting 7 to 14 calendar days before the planned start of slab installation. The contractor shall arrange for an on site meeting with representatives from the UHPC and the precast system suppliers. The contractor's staff and the NYSDOT Engineer and Inspectors shall attend the site meeting. The objective of the meeting will be to clearly outline the procedures for placing and leveling the precast concrete panels and for mixing, transporting, finishing and curing of the UHPC material.

Form Work, Batching and Curing

The design and fabrication of forms shall follow approved installation drawings and shall follow the recommendations of the manufacturer. All the forms for UHPC shall be constructed from plywood or approved equal. The forms shall be coated to prevent absorption of water using a form release agent from the Department's Approved List of Materials.

The contractor shall follow the batching sequence as specified by the supplier and approved by the DCES. The surface of the UHPC field joints shall be filled as shown on the approved drawings.

The UHPC in the form shall be cured according to Manufacturer's recommendations to attain the required strength shown on the contract documents.

Quality Control

The contractor shall measure the slump flow on each batch of UHPC. The slump flow will be conducted using a mini-slump cone. The flow for each batch shall be between 7 in. and 10 in. The slump flow for each batch shall be recorded in the QA/QC log. A copy of the log shall be given to the Engineer.

Estimation of In-Place Strength:

1. Two thermocouples per each UHPC joints, one at each end, shall be installed. The locations of these installations shall be shown on the installation drawings. These locations shall be revised if directed by the DCES. The thermocouple wiring may be connected to reinforcing steel, but probe endings may not be in direct contact with the steel. Consider structural or exposure conditions when placing thermocouples.

2. Listed actions are allowed when the maturity value of all the thermocouples reaches the corresponding strength values listed below.

Action	Strength Requirement
Removal of top forms	10 ksi
Open Bridge deck to Traffic	12 ksi

3. Record and save the maturity data from the meter until the strength reaches 21 ksi. Disconnect the meter and clip all wires flush with the concrete surface.

A continuous read thermocouple or thermistor with a data logger can be used to estimate in place strength. The methodology outlined in ASTM C 1074-11 will be used. The maturity function used to estimate strength will be calculated with the same formula that is used by the maturity meter that established the initial strength maturity relationship. Copies of the calculations will be provided to the engineer.

Validation of the Strength-Maturity Relationship:

For each day of placement, perform validation tests by casting 7 cylinders. Equip one of the cylinders with a thermocouple. Test the cylinders as close as possible to the maturity value corresponding to 21 ksi. Record the maturity value immediately prior to testing. All testing shall be conducted by an AASHTO accredited testing lab. Report the results to the DCES.

If the average value of compressive strength of each pair of cylinders is within 10% of the estimated value, the strength-maturity relationship will be validated. If the average cylinder value is more than 10% below the estimated value, the strength maturity relationship will need to be re-established. If the first four cylinders produce acceptable results, the remainder need not be tested.

The Department may perform additional testing for research purposes. Casting and testing in addition to that required in this spec will be performed by NYSDOT personnel.

In case of loss of required data, or non verification of the strength-maturity relationship, use the cylinders cast above, one pair at a time, to verify the strength.

ITEM 557.6401XX03 - PRECAST CONCRETE DECK - TYPE XX FRICTION
ITEM 557.6403XX03 - PRECAST CONCRETE APPROACH SLAB - TYPE XX FRICTION
ITEM 557.11010003 - INTEGRAL PRECAST CONCRETE BARRIER

METHOD OF MEASUREMENT. For precast concrete bridge decks and precast concrete approach slabs apply all the provisions of §557-4. For precast concrete bridge barrier apply all the provisions of §569-4.

BASIS OF PAYMENT. For precast concrete bridge decks and precast concrete approach slabs apply all the provisions of §557-5. For precast concrete bridge barrier apply all the provisions of §569-5.

ITEM 559.16960118 - PROTECTIVE SEALING OF STRUCTURAL CONCRETE

ITEM 559.17960118 - PROTECTIVE SEALING OF STRUCTURAL CONCRETE FOR EXISTING BRIDGE DECKS

DESCRIPTION. Under this work the Contractor shall furnish and apply, in accordance with this specification, a protective sealer to concrete surfaces, at locations indicated on the plans or where directed by the Engineer.

MATERIALS. The protective sealer used on concrete surfaces shall be one appearing on the Department's Approved List and shall meet the requirements of one of the following subsections:

717-03 - Penetrating Type Protective Sealers
717-04 - Coating Type Protective Sealers

CONSTRUCTION DETAILS.

A. General. Only penetrating type sealers shall be applied to walking or riding surfaces. The Contractor shall provide the Engineer with the sealer Manufacturer's written instructions for application and use, at least five (5) working days before the start of work. Only one (1) brand and specific type of sealer will be allowed for use on each individual element of a project (i.e. each pier, deck, abutment, etc.).

B. Surface Preparation.

1. New Concrete. All required surface texturing, and saw cut grooving, shall be completed before the surface is prepared. All concrete that is to be sealed shall air dry for fourteen (14) days after curing has been removed, or for the length of time specified in the manufacturer's written instructions, whichever is longer. If the concrete is subjected to rain or moisture from other project operations, the drying period shall be extended twenty-four (24) hours for every day the concrete is subjected to water. After the drying period has ended, the concrete surface shall be lightly sand or shot blasted, followed by vacuum cleaning, to remove loose particles.

2. Existing Concrete. Concrete surfaces to be sealed shall be thoroughly cleaned by light sand or shot blasting, followed by vacuum cleaning, to remove loose particles. If the concrete is subjected to rain or moisture from other project operations, the surface will be allowed to air dry for a minimum of forty-eight (48) hours before the sealer is applied.

Care shall be taken while blast cleaning that all dirt is removed with minimal exposure of coarse aggregate. After cleaning, no blasting residue, laitance, curing compounds, standing water, oil, dirt or other foreign particles shall be present, which may prevent penetration or adhesion of the sealer. All surface preparation work shall be completed and approved by the Engineer, before sealer application can commence.

C. Weather Limitations. Sealer materials shall not be applied during wet weather conditions or, if in the opinion of the Engineer, adverse weather conditions are anticipated within twelve (12) hours of the completion of sealer application. Ambient and surface temperatures shall be a minimum of 40^{o}F-during application and until the sealed concrete is dry to the touch. Application by spray methods will not be permitted during windy conditions, if in the opinion of the Engineer unsatisfactory results will be obtained.

D. Sealer Application. The sealer shall be used as supplied by the Manufacturer without thinning or alteration, unless specifically required in the Manufacturer's instructions. Thorough mixing of

the sealer before and during its use shall be accomplished as recommended by the Manufacturer. Equipment for sealer application shall be clean of foreign materials and approved by the Engineer before use.

If a penetrating sealer is used, a minimum of two (2) coats of the sealer shall be applied to achieve uniform coverage. The total quantity of sealer applied by all coats shall be equal to the quantity required at the application rate specified in the Approved List. The second and each additional coat shall be applied perpendicular to the previous coat. Care shall be taken when applying each coat, such that running or puddling does not occur. Each coat shall be allowed to dry for a minimum of two (2) hours before the next coat is applied. The final coat shall be allowed to dry according to the manufacturer's instructions, before the removal of maintenance and protection of traffic.

On sloping and vertical concrete surfaces, sealer application shall progress from bottom to top. Care shall be taken to ensure that the entire surface of the concrete is covered and all pores filled.

METHOD OF MEASUREMENT. The work will be measured as the number of square feet of structural concrete sealed.

BASIS OF PAYMENT. The unit price bid per square feet shall include the cost of furnishing all labor, materials and equipment necessary to satisfactorily complete the work.

Payment will be made under:

Item No.	Item	Pay Unit
559.16960118	Protective Sealing of Structural Concrete	Square Foot
559.17960118	Protective Sealing of Structural Concrete for Existing Bridge Decks	Square Foot

ITEM 559.18960118 - PROTECTIVE SEALING OF STRUCTURAL CONCRETE ON NEW BRIDGE DECKS AND BRIDGE DECK OVERLAYS

DESCRIPTION. Under this work the Contractor shall furnish and apply, in accordance with this specification, a protective sealer to concrete surfaces, at locations indicated on the plans or where directed by the Engineer.

MATERIALS. The protective sealer used on new concrete bridge decks shall be one appearing on the Department's Approved List, which does not contain an aqueous solvent/carrier and shall meet the requirements of the following subsection:

717-03 - Penetrating Type Protective Sealers

CONSTRUCTION DETAILS.

A. General. The Contractor shall provide the Engineer with the sealer manufacturer's written instructions for application and use, at least five (5) working days before the start of work. Only one (1) brand and specific type of sealer will be allowed for use on each deck.

B. Surface Preparation. All concrete bridge decks shall air dry for twenty-four (24) hours after the time of completion of saw cut grooving. If the concrete is subjected to rain or moisture from other project operations, the drying period shall be extended twenty-four (24) hours from the time that the concrete has stopped being wetted. All required surface texturing, saw cut grooving, barriers, parapets, sidewalks and safetywalks shall be completed, before the surface is cleaned. After the drying period has ended, the concrete surface shall be cleaned by vacuum methods, to remove loose particles.

After cleaning, no laitance, standing water, oil, dirt or other foreign particles shall be present, which may prevent penetration of the sealer. All surface preparation work shall be completed and approved by the Engineer before sealer application can commence.

C. Weather Limitations. Sealer materials shall not be applied during wet weather conditions or when adverse weather conditions are anticipated within twelve (12) hours of the completion of sealer application. Ambient and surface temperatures, during application, and until the sealed concrete is dry to the touch, shall be a minimum of 40^{o}F. Application by spray methods will not be permitted during windy conditions, if in the opinion of the Engineer, unsatisfactory results will be obtained.

D. Sealer Application. The protective sealer shall be used as supplied by the Manufacturer without thinning or alteration. Equipment for sealer application shall be clean of foreign materials and approved by the Engineer before use. The sealer shall be applied by brushing, spraying or rolling, as recommended by the Manufacturer.

A minimum of two (2) coats of the sealer shall be applied to achieve uniform coverage. The total quantity of sealer applied by all coats shall be equal to the quantity required at the application rate specified in the Approved List. The second and each additional coat shall be applied perpendicular to the previous coat. Care shall be taken when applying

each coat, such that running or puddling does not occur. Each coat shall be allowed to dry for a minimum of two (2) hours before the next coat is applied. The final coat shall be allowed to dry according to the Manufacturer's instructions, before the removal of maintenance and protection of traffic.

METHOD OF MEASUREMENT. The work will be measured as the number of square feet of concrete sealed.

BASIS OF PAYMENT. The unit price bid per square feet shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work.

ITEM 559.91100010 - ANTI-GRAFFITI PROTECTIVE COATING

DESCRIPTION

Under this item, the Contractor shall clean, furnish and place anti-graffiti protective coating on noise barrier walls, retaining walls, bridge structures, barriers, or other concrete surfaces at locations indicated in the contract documents or approved by the EIC. Wood surfaces shall not be treated with anti-graffiti protective coating under this item.

The Contractor shall apply the protective coating on selected surfaces within the limits in the contract documents. In addition, the Engineer may order that certain areas receive increased coverage or new locations be added.

MATERIALS

The protective coating shall be a breathable, one component clear non-sacrificial urethane or acrylic water based formulation designed as an anti-graffiti solution.

The Contractor shall provide the manufacturer's product literature including surface preparation data, mixing, application, spread rates, storage and Volatile Organic Compounds (VOC) compliance certification.

All materials are to be approved by the Engineer and the Regional Landscape Architect before any work can begin.

CONSTRUCTION DETAILS

1. The selected surfaces shall be thoroughly cleaned of dust, dirt, grease, oil, loose materials or other objectionable materials before applying the protective coating. No sandblasting will be allowed. Anti-graffiti coating shall be applied as soon as practicable after cleaning is completed. If in the opinion of the Engineer, the surface has become soiled, or otherwise contaminated, prior to the application of the protective coating; the surface shall be re-cleaned at no additional cost to the State.

2. Surface and material temperatures shall be a minimum of 40^{o} F or as recommended by the manufacturer.

3. Material shall be applied by brush, roller or low-pressure spray. The rolling shall be done only on smooth surfaces and at such a pace that no spinning of the roller or throwing off of protective coating material occurs when the roller is lifted from the surface. Coverage rate shall be as recommended by the manufacturer and as approved by the Engineer.

4. The protective coating shall be applied in a uniform manner to evenly coat all pores and textured areas. Extremely textured or porous surfaces will require a second coat. Unless otherwise designated by the Engineer, the protective coating shall be applied from

column to column, post to post, and from bottom to a height of 8 feet 2.5 for noise barrier wall panels, and from joint to joint or scoremark to scoremark and from bottom to a height of 8 feet for abutments, walls or other surfaces.

5. Avoid high wind and rain, prolonged exposure in summer sunlight, and keep from freezing 12 hours after application.

6. A test panel 5 foot x 5 foot shall be provided and coated to insure suitability, number of coats required, and desired results. The test panel application and results shall be inspected and approved by the Engineer and the Regional Landscape Architect.

7. All work must conform to the OSHA standards referred to in subsection 107-05 of the Standard Specifications.

8. No dilution can happen of dilution or cleaner.

METHOD OF MEASUREMENT

This work will be measured by the number of square feet of surface covered with the anti-graffiti coating applied, in accordance with this specification. Test panels prepared under this item will not be measured for payment.

BASIS OF PAYMENT

The unit price bid per square foot shall include the cost of furnishing all labor, materials and equipment necessary to prepare the surfaces and apply the coating in accordance with the contract documents and as directed by the Engineer. The cost of providing necessary test panels shall also be included in the price bid for this item.

ITEM 559.92010011 - GRAFFITI REMOVAL FROM UNTREATED SURFACES

DESCRIPTION

This work shall consist of removing graffiti by the methods described in this specification.

MATERIALS

All materials and equipment shall be subject to the Engineer's approval before any work can begin.

Abrasive material for blast cleaning shall meet the requirements of **§572-2.01, Abrasive for Blast Cleaning.**

PAINT All paint used shall meet the following requirements:

The primer shall be a quality primer with good hiding power and formulated specifically for the purpose of covering graffiti. It shall be compatible with the surface it is used on as per the manufacturer's data sheet, and must adhere well to the substrate and resist fading and chalking. Additional coats of paint shall be flat exterior paint, compatible with the primer and the substrate. Compatibility should be verified by the paint manufacturer's product data sheet. A textured paint may be used as approved by the Engineer.

The paint shall comply with the volatile organic compound (VOC) requirements of New York State Department of Environmental Conservation regulation 6 NYCRR Part 205, Architectural Surface Coatings.

The Paint shall be mixed to match the color of the adjacent surface to the satisfaction of the Engineer, unless otherwise directed.

POWER WASH Soluble, abrasive blast media shall be a large crystal sodium bicarbonate or a magnesium sulfate based media. Solubility of the media in water shall be .56 lbs/100 fl. oz. The equipment with the media shall be a soluble media injector type power washer. The Contractor shall submit catalog cuts or other documentation for all equipment proposed for use in this work.

SOLVENT WASH The cleaning compound shall be a blend of an organic solvent of emulsifiers and surfactants. It shall be a bio-degradable water based mixture developed from non-toxic and non-corrosive substances. This may be a soybean solution or other, satisfactory to the Engineer. Mineral spirits are also acceptable for this usage.

The cleaner shall lift graffiti from the substrate surface, and emulsify and dissolve the paint constituents; pigments; oils; binders and fillers. The material(s) used shall not damage, mar or reduce the reflectivity of the substrate, when used on a sign panel. Acceptance of the cleaning compound will be based on the manufacturer's certification that the material conforms to the requirements of this specification.

Some acceptable solvents include the following: Orange Magic Cleaner, as manufactured by Orange Power, 257-02 Craft Ave., Rosedale, NY 11422; 3M Citrus Base Natural Cleaner, manufactured by 3M Adhesives, Coatings and Sealers Division, St. Paul, Minnesota 55144; Enviro-Solutions Paint Stripper & Graffiti Remover, by RCI Trading, P.O.Box 1789, Englewood, CO. 80150-1789; SOY solv, 6154 N CR 33, Tiffin, OH 44883; EZ Solv, by Gemtek, 3808 North 28th Street, Phoenix, AZ, 85017, (800) 331 - 7022; Taginator, by Equipment Trade Service, 20 E. Winona Ave, Norwood, PA 19074; Graffiti Free Cleaner, Enviro-Northeast, PO Box 975 Highland Lakes N.J. 07422; or Mineral Spirits.

CONSTRUCTION DETAILS

All work must conform to the OSHA standards referred to in subsection 107-05 of the Standard Specifications.

Unless otherwise directed by the Engineer, the following methods shall be used to remove

graffiti from various surfaces. If one of these prescribed methods is used, and the graffiti still remains visible, the contractor shall use an alternate method approved by the Engineer. Painting over graffiti is the preferred option on previously painted surfaces, and where solvents were unsuccessful at removing graffiti.
Unless otherwise noted or directed by the Engineer, graffiti shall be removed within five (5) working days of written notification. If a lift device will be necessary, the removal date will be extended to ten (10) working days.

GRAFFITI SURFACE	SUGGESTED GRAFFITI REMOVAL METHOD
Steel (smooth, non-porous) Wood (painted or unpainted)	Solvent Wash with Enviro-Solutions Paint Stripper & Graffiti Remover; SOYsolv; Mineral Spirits or Painting Over Graffiti or Power Washing
Brick, Stone, Concrete, Paving blocks (porous, unpainted)	Solvent Wash with Taginator, or Power Washing, or Painting Over Graffiti or Abrasive Blasting
Painted masonry	Painting Over Graffiti or Power Wash
Sign Panel Faces & Aluminum (unpainted mill finish or anodized finish)	Solvent Washing with Enviro-Solutions Paint Stripper & Graffiti Remover; SOY solv; EZ Solv or Mineral Spirits.

PRIORITY GRAFFITI REMOVAL
Graffiti of a particularly offensive nature, in the opinion of the Engineer, shall be removed by the contractor within one (1) day after written notification of the existence of such graffiti. This shall be called PRIORITY GRAFFITI REMOVAL, and will be paid at twice the bid price for the removal method(s) selected.
PAINTING OVER GRAFFITI
The Contractor shall paint over all graffiti on the concrete surfaces within limits in the contract documents, A.O.B.E., and take appropriate precautions to prevent paint from falling onto traffic. The substrate surfaces shall be thoroughly cleaned before painting. All dust, dirt, oil, grease, and other substances which might prevent the adhesion of the paint to the substrate shall be removed. No sandblasting will be allowed. Paint shall be applied as soon as practicable after cleaning is completed. If in the opinion of the Engineer, the substrate surface has become soiled, or otherwise contaminated, prior to the application of the paint, the surface shall be recleaned at no additional cost to the State. The paint shall be applied evenly in a neat and workmanlike manner by a roller or other suitable method, as approved by the Engineer. The rolling shall be done at such a pace that no spinning of the roller or throwing off of paint occurs when the roller is lifted from the surface. The paint shall be feathered out by using light pressure at the end of the stroke to promote uniformity. The first time a surface is painted, it shall be painted from column to column, post to post, and from top to bottom for panels and from joint to joint or scoremark to scoremark for other concrete surfaces. After the first time, which includes previous painting for graffiti removal, the substrate surface shall be painted in small rectangular patterns in order to minimize the area painted and ensure that the graffiti will no longer be “readable” when the painting is complete. If the paint to be applied requires more stringent or additional surface preparation than stated in this specification, the Contractor shall prepare the surface in

accordance with the paint manufacturer's recommendations.
The graffiti must be completely hidden before the painted area will be measured for payment. The Contractor will be required to repaint areas if the graffiti remains visible after painting at no additional cost to the State. New graffiti at the same location will be measured for payment when the painting meets the requirements of this specification. The Engineer may require sand be added to the paint to provide a texture to the final surface.

POWER WASHING GRAFFITI SURFACES

All graffitied surfaces shall be cleaned with a soluble, abrasive blasting media applied with a soluble media injector at 2973.3 Psi, 5 gal per minute or a compressed air delivery system at 100 Psi, 37 gal/second, whichever is satisfactory to the Engineer. No particulate matter of any nature shall be permitted to remain on the cleaned surface. After cleaning, the surface shall be rinsed with tap water applied with a power washer at 1000 Psi. All visible media shall be removed from the surface.
After rinsing, the Contractor shall repeat the cleaning process in areas where graffiti or paint is still visible. If the second cleaning process fails to remove the graffiti or paint to the Engineer=s satisfaction, the equipment and methods used by the Contractor will again be subject to review and approved by the Engineer. Cleaned surfaces shall bear no evidence of graffiti paint layers.

SOLVENT WASHING GRAFFITI SURFACES

Pre-Cleaning Materials.
A wet, non-abrasive cleanser is recommended. This cleanser shall not contain strong solvents or alcohols.
Pre-Cleaning Procedure.
Cleanse the surface of loose dirt particles with clean water.
Use a soft sponge or brush to wash the graffitied surface with detergent and water. Avoid scrubbing the surface unnecessarily. After the cleaner has been utilized, apply a steady stream of water on the cleaned surface to wash the dirt particles away.
Allow to dry.
Cleaning Procedure.
The Contractor shall supply the instructions of the cleaning procedure, to the Engineer, at least two weeks prior to starting this work. Graffiti Removal material shall be applied to surfaces as per the manufacturer's instructions. Graffiti Removal material shall not be applied to silk screen processed areas.
After the solvent is applied, the surfaces shall then be wiped with a non-abrasive material.
The wiped surfaces shall then be rinsed with a water wash.
The cleanliness of the surfaces is subject to the approval by the Engineer.
After rinsing, the Contractor shall repeat the cleaning process in areas where graffiti is still visible. If the second cleaning process fails to remove the graffiti to the Engineer's satisfaction, the equipment and methods used by the Contractor will again be subject to review and approval by the Engineer.
Cleaned surfaces shall bear no evidence of graffiti. The cleaning of the graffiti image shall be feathered out by using light pressure at the end of the stroke to promote uniformity on the surrounding surface.

ABRASIVE BLASTING OFF GRAFFITI

Due to the potential of abrasive blasting to damage the substrate, this method of graffiti removal may only be performed as a last resort, at the direction of the Engineer, after all other methods to remove graffiti have failed.

Graffiti should be removed using vacuum-shrouded blasting or power-tool equipment that has the appropriate attachments for the surface being cleaned to ensure that no dust or abrasive escapes during operation. This equipment should be capable of cleaning all the graffiti off the surface at a rate acceptable to the engineer while producing no detectable dust. The equipment should operate in a manner such that all dust or abrasive/dust mix generated is simultaneously drawn away from the contact surface into attached vacuum hoses leading to a vacuum that utilizes HEPA filters. The vacuum and its hoses should be sufficiently rated for the volume of debris and/or abrasive/debris generated. A containment similar to that described and paid for under item 570.09nnnn Environmental Ground Protection may be employed if found necessary. The equipment, its method of use, and efficiency shall be demonstrated to the Engineer prior to the start of work. Manufacturers of this type of equipment include Pentek Inc. of Coraopolis, PA among others.

Power tool cleaning should remove the graffiti without causing undue damage to the surface being cleaned.

GRAFFITI REMOVAL FROM OVERHEAD STRUCTURES

If the use of a mechanical aerial lift is required to safely access the graffitied surface, the Contractor shall obtain the necessary equipment and use it in conjunction with the other graffiti removal items.

METHOD OF MEASUREMENT

This work will be measured by the number of square feet, measured to the next whole square feet, of surface area that graffiti is either removed from, or painted over, in accordance with this specification.

If the use of a mechanical aerial lift is required to safely access the graffitied surface, the Contractor will be paid for GRAFFITI REMOVAL FROM OVERHEAD STRUCTURES, which will be measured as the number of structures for which the lifting device is required.

BASIS OF PAYMENT

The unit price bid per square meter shall include the cost of furnishing all labor, materials and equipment necessary to complete the work.

There will be no payment for removing graffiti that is not done within the time limitations stated in this specification.

If one of the graffiti removal methods is approved by the Engineer, and the graffiti still remains visible, and the Engineer suggests an alternate method to remove the graffiti, the contractor will be paid for both graffiti removal methods.

If the use of a mechanical aerial lift is required to safely access the graffitied surface, the Contractor will be paid for GRAFFITI REMOVAL FROM OVERHEAD STRUCTURES, in addition to other graffiti removal items.

Particularly offensive graffiti designated by the Engineer for PRIORITY GRAFFITI REMOVAL will be paid at twice the bid price for the removal method(s) selected.

Item No. Item Pay Unit

559.92010011 Graffiti Removal by Painting Over Graffiti Square Feet
559.92020011 Graffiti Removal by Power Wash Square Feet
559.92030011 Graffiti Removal by Solvent Washing Square Feet
559.92040011 Graffiti Removal by Abrasive Blasting Square Feet
559.92050011 Graffiti Removal from Overhead Structures Each Structure

ITEM 564.20010008 – HOT-DIP GALVANIZING OF STRUCTURAL STEEL

DESCRIPTION

This work shall consist of hot-dip galvanizing of fabricated structural steel members.

MATERIALS

Materials for galvanizing shall meet the requirements of §719-01, Type I.

CONSTRUCTION DETAILS

Hot-dip galvanizing shall be in accordance with the material specifications.

Galvanizing shall be performed consistent with the current New York State Steel Construction Manual.

METHOD OF MEASUREMENT

This work will be measured as the number of pounds of steel hot-dip galvanized and installed as per the contract documents.

BASIS OF PAYMENT

The unit price bid per pound shall include the cost of all labor, materials, and equipment necessary to satisfactorily complete the work including transportation to and from the galvanizing facility and any necessary drilling or reaming. No additional payment will be made for additional fabrication steps required as a result of the galvanizing process.

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ITEM 566.13141501 – ELASTOMERIC EXPANSION JOINT SYSTEM
ITEM 566.13142001 – ELASTOMERIC EXPANSION JOINT SYSTEM – WITH WEAR PLATES

DESCRIPTION

This work shall consist of furnishing and installing an Elastomeric Expansion Joint System or Elastomeric Expansion Joint System – With Wear Plates, at the locations indicated in the contract plans, in accordance with this specification and the joint system Manufacturer's instructions. The Contractor shall notify the Deputy Chief Engineer, Structures (DCES) of the name and address of the fabricator of all bridge joint systems in accordance with §106-01 Sources of Supply.

Elastomeric Expansion Joint System consists of an elastomeric slab of a specific shape to permit the required expansion and contraction of the joint system. The slab is reinforced with internal steel plates. The joint system is bolted to supporting material on each side of the joint opening. The vertical interface between the joint and the supporting material is sealed to prevent water intrusion. A flexible elastomeric drainage trough is attached to both sides of the joint and sloped transversely to drain.

Elastomeric Expansion Joint System – With Wear Plates has all the features of Elastomeric Expansion Joint System and includes aluminum skid resistance plates which are molded onto the top surface.

MATERIALS

The joint system and all its component parts shall be supplied by the Manufacturer. The Manufacturer shall certify that the following components meet the listed requirements:

All steel components of the joint system shall meet the requirements of ASTM A709, Grade 50. Use of ASTM A709, Grade 36 shall also be permitted.

All fasteners shall be stainless steel and meet the requirements of §715-16.

Flexible material for drainage troughs shall be neoprene or natural rubber meeting the requirements of ASTM D2000-12 M2BC517A14B34.

Aluminum wear plates shall be alloy 6061-T6 (ASTM B 221-73).

Shop Drawings shall be required for any joint system supplied as part of this work. Shop Drawings shall be prepared and reviewed in accordance with the applicable provisions of the SCM and this Specification and submitted to the Engineer for approval. All Shop Drawings shall note the name and address of the Joint System Fabricator, including the actual location (address) where the fabrication will take place although no shop inspection shall be required.

The joint system Manufacturer's instructions for the proper installation of the joint system

shall be included on the Shop Drawings. Manufacturer's instructions shall include the proper width settings for various ambient temperatures. Shop Drawings which lack Manufacturer's installation instructions shall be returned without examination.

Fabrication shall not commence until the Engineer has approved the shop drawings and authorized fabrication.

The fabricated joint system will be accepted at the work site by the Engineer after a visual inspection and upon receipt of the Manufacturer's Certification Report (MCR) that the materials and the fabricating procedures were in accordance with the Approved Shop Drawings and this Specification. The Manufacturer shall submit, with the MCR, a Certified Copy of the Mill Test Report (MTR) for all steel used to fabricate the joint system.

CONSTRUCTION DETAILS

The concreting surface leveling accuracy, installation of anchoring system, installation of drainage system under the joint, and installation of elements shall be as per the joint Manufacturer’s instructions. The concrete block out and deck opening shall be based on the specific joint system used.

A minimum gap of $^{1}/_{4}$ inch (+ $^{1}/_{8}$ inch) shall be provided between the concrete edge and joint system and it shall be filled with silicone joint sealant per §705-05.

The drainage channel shall be bonded and bolted to the connecting parts.

The joint system shall include provisions to allow for routine maintenance including cleanout of the drainage trough.

After the joint system is permanently installed, including plates and all concrete placements, a watertight integrity test of the joint system shall be performed. The test shall be done in accordance with the requirements of §567-3.01H.

METHOD OF MEASUREMENT

This work will be measured as the number of linear feet of expansion joint system satisfactorily furnished and installed.

BASIS OF PAYMENT

The unit price bid per linear foot shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work.

ITEM 572.0002NN01 - METALIZING

DESCRIPTION

This work shall consist of furnishing all materials and equipment necessary and to apply metalizing in accordance with the contract documents and as directed by the DCES.

Qualification of Metalizing Contractor

The metalizing contractor performing the work shall document previous experience in providing surface preparation for metalizing and metalizing application services in the shop and field, with a minimum history of three (3) successfully completed projects of similar complexity. The contractor shall be certified per the requirements of SSPC-QP 3.

The contractor shall submit experience and qualification records of all personnel performing the work.

Qualification of Thermal Spray Technicians and Personnel

The thermal spray technicians shall be qualified in accordance with ANSI/AWS C2.16 with a minimum passing adhesion of 700 psi, and must hold a certificate of satisfactory completion of training from the equipment manufacturer. The equipment used for qualification shall be equivalent to that used in production.

Each metalizing shift shall have at least one metalizing supervisor, meeting the thermal spray technician requirements, and who will additionally have a minimum of three years documented satisfactory metalizing experience on similar projects.

An SSPC certified Quality Control Supervisor shall be on the thermal spray company's staff and shall provide a Quality Control Plan to the DCES prior to the onset of work. The Quality Control Supervisor shall meet the requirements of Thermal Spray Supervisor as per SSPC-QP 6. Additionally, the Quality Control Supervisor shall have a minimum of five (5) years experience with satisfactory performance in abrasive blast cleaning of steel surfaces according to SSPC-SP 10 and shall have performed similar duties on two successful metalizing projects.

Codes and Standards

The provisions set forth in the latest issue of the following codes and standards shall apply unless otherwise indicated in the contract documents:

ASTM B 833, Standard Specification for Zinc Wire for Thermal Spraying (Metalizing).
ASTM C 633, Test Method for Adhesive/Cohesive Strength of Flame Sprayed Coatings.
ASTM D 4285, Method for Indicating Oil or Water in Compressed Air.
ASTM D 4417, Test Method for Field Measurement of Surface Profile of Blasted Steel.
NACE Standard RP0287, Field Measurement of Surface Profile of Abrasive Blast Cleaned Steel Surfaces Using a Replica Tape.
ASTM D 4541, Test Method for Pull-Off Strength of Coating Using Portable Adhesion Testers.

ASTM E1920, Standard Guide for Metallographic Preparation of Thermal Sprayed Coatings.
ASTM E2109, Standard Test Methods for Determining Area Percentage Porosity in Thermal Sprayed Coatings.
ANSI/AWS C2.16, Guide for Thermal-Spray Operator Qualification
ANSI/AWS C2.18, Guide for the Protection of Steel with Thermal Spray Coatings of Aluminum, Zinc, and Their Alloys and Composites.
SSPC-CS 23.00/AWS C2.23M/NACE No. 12, Specification for the Application of Thermal Spray Coatings (Metalizing) of Aluminum, Zinc, and their Alloys and Composites for the Corrosion Protection of Steel.
SSPC Publication, The Inspection of Coatings and Linings: A Handbook of Basic Practice for Inspectors, Owners, and Specifiers.
SSPC-AB 1, Mineral and Slag Abrasives.
SSPC-AB 2, Specification for Cleanliness of Recycled Ferrous Metallic Abrasives.
SSPC-AB 3, Ferrous Metallic Abrasives.
SSPC-PA 1, Shop, Field, and Maintenance Painting of Steel.
SSPC-PA 2, Measurement of Dry Coating Thickness with Magnetic Gages.
SSPC-QP 3, Standard Procedure for Evaluating Qualifications of Shop Painting Applicators SSPC-QP 6, Standard Procedure for Evaluating the Qualifications of Contractors Who Apply Thermal Spray (Metalizing) for Corrosion Protection of Steel and Concrete Structures
SSPC-SP 1, Solvent Cleaning
SSPC-SP 10/NACE No. 2, Near-White Blast Cleaning.
SSPC-SP 11, Power Tool Cleaning to Bare Metal
SSPC-VIS 1, Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning.

Quality Control Plan

Prior to the start of work, the Contractor's QC Supervisor shall provide a written quality control plan and submit it to the DCES for approval. The plan shall include the procedure to be followed and equipment to be used for all processes outlined herein, including surface preparation and metalizing and seal coat application. The plan shall include a method of adhesion testing, thickness measuring, bend test protocol, testing frequency, and MSDS sheets for material utilized on the project. The plan shall outline the quality assurance procedures and any safety precautions that must be followed by workers and inspectors. No work shall commence until the DCES has approved the plan.

Job Reference Standard (JRS)

A job site pass/fail Job Reference Standard, representative of the work to be performed, shall be prepared by the metalizing applicator. The JRS will be used to evaluate the suitability of the application process. The JRS shall be made on a steel plate approximately 18 in. x 18 in. x 0.25 in. and shall be made with the actual equipment and process parameters and procedures (surface preparation, metalizing, sealing, and testing) that shall be used for the contracted work. The JRS shall be made in similar environmental conditions as the work to be performed. Thickness measurements and adhesion tests shall be performed on the JRS per this specification. The JRS

will be deemed unsatisfactory if any of the measurements or test results is less than the values indicated herein.

Metallographic testing shall be performed, in accordance with ASTM E1920 and ASTM E2109, on a JRS meeting the requirements of this section. Porosity of the metalized coating shall be less than 10% with less than 5% air inclusions in the film, and shall be fully bonded to the substrate with no air pockets between the coating and substrate. There shall be no interconnected porosity to the substrate for the contract specified thickness, intended technique of application, number of passes, and thickness applied per pass.

For steel assemblies exhibiting acute angles between structural members to be metalized in the shop after assembly, a similarly scaled steel, blasted mockup must be put together emulating the angles encountered. This mockup shall be metalized by the coating applicator, disassembled and adhesion testing shall be performed on the metalizing in the acute angle, per these specifications. If the mockup fails the adhesion test, the applicator shall change the application technique and/or adjust equipment to obtain proper adhesion results, thickness measurements and appearance requirements in acute angles.

Job Control Record (JCR)

The Contractor shall keep a Job Control Record, detailing the essential job information and the in-process quality control checkpoints required by this standard. The JCR shall include information on safety precautions, and the equipment, parameters, and procedures for surface preparation, thermal spraying, and sealing. Failure to perform production work in a manner consistent with the JCR guidelines will be cause for rejection.

MATERIALS

A. METALIZING

Certified alloy wire is required, and shall be composed of 85% zinc and 15% aluminum by weight. Wire shall meet the requirements of ASTM B-833 Standard Specification for Zinc and Zinc Alloy Wire for Thermal Spraying (Metalizing) for the Corrosion Protection of Steel. The Contractor shall submit a certificate with results of testing for chemical analysis to the DCES, for each lot of wire used on the job. The Contractor shall obtain written certification from the manufacturer of the alloy and will provide the certifications for each lot of wire a minimum of five business days prior to commencement of metalizing.

The metalizing 85/15 alloy shall have a minimum tensile bond of 700 psi.

B. ABRASIVE FOR BLAST CLEANING

Blast media shall be angular steel grit, angular aluminum oxide, or angular crushed slag, evaluated per SSPC-AB 3 for new abrasive material, and shall be capable of producing an angular anchor tooth profile. If abrasive material is to be recycled, the abrasive material shall be

evaluated prior to each reuse per the requirements of SSPC-AB 2. Use of silica sand, steel shot, or any other abrasives that result in a round surface profile is prohibited.

C. SEALER

Sealer shall UV resistant and be a urethane or epoxy polyamide penetrating sealer, type as recommended by the supplier for use on metalized surfaces. The sealer shall be VOC compliant for use in New York State. Sealer shall be of such viscosity to penetrate pores in metalized coating.

D. SUBMITTALS

The metalizing applicator shall submit the detailed procedures for surface preparation, metalizing application, and application of sealer coat, conforming to these specifications. The procedures shall detail the equipment, application process, in-process quality control, and Job Control Record to be used for the contract work. The information shall include:

1. Detailed procedures for surface preparation, thermal spraying, seal coating, and the in-process quality control checkpoints.
2. Equipment (surface preparation, thermal spraying, seal coating, and the in-process quality control) to be used and for which the detailed procedures apply.
3. Product Data and MSDS sheets for sealer.
4. Blasting media, thermal spray feedstock materials, and seal coat product.
5. Job Reference Standard.
6. Job Reference Standard test results report.
7. Job Control Record.
8. Repair of defective coatings per ANSI/AWS C2.18.
9. Certification of Class B slip coefficient and creep resistance. The certification shall include the written test results, including the thickness range required to meet the certification. Certification of Class B slip and creep resistance is not required for metalized to metalized faying surfaces meeting the requirements of this specification.

This information shall be submitted at least 10 work days prior to the schedule start of the Job Reference Standard (JRS).

CONSTRUCTION DETAILS

A. SURFACE PREPARATION

Prior to blast cleaning, steel surfaces shall be Solvent Cleaned in accordance with SSPC-SP 1, Solvent Cleaning, to remove all visible oil, grease, dirt, salt, and other contaminants. Then, all surfaces to be metalized shall be cleaned to SSPC-SP 10, Near-White Blast Cleaning, standards. All cleaning and coating shall be performed at the same facility. Surface finish and cleanliness shall be confirmed according to SSPC-VIS 1 standards. In the event of a dispute, the written SSPC SP-10 standard will take precedence.

Unacceptably hard surfaces, as defined by section 602 of the NYSDOT Steel Construction Manual, shall be removed by grinding, machining, or approved heat treating procedures, prior to abrasive blasting.

The substrate shall have an angular anchor tooth profile of 3 to 5 mils. Surface Profile measurements shall be made using X-course profile tape and a micrometer, as outlined in ASTM D4417. "Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel/NACE Standard RP0287, Field Measurement of Surface Profile of Abrasive Blast Cleaned Steel Surfaces Using a Replica Tape." Spot measurements shall be made approximately every 2000 ft^2 for automated blasting or 200 ft^2 for manual blasting. Take three measurements for each spot in an area approximately 1.5 in^2. Average the measurements and record in the Job Control Record.

Compressed air shall be free of oil and water and shall meet ASTM D4285, method for Indicating Oil or Water in Compressed Air. Utilize a compressed air system capable of delivery at the nozzle of 125 cfm at 120 psi. To minimize any contamination, use an oil/water separator on the airline. 120 psi of compressed air maintains the proper atomization of the molten wire producing the optimum spray pattern.

B. SYSTEM REQUIREMENTS

Only certified spooled metalizing wire, which is properly drawn, spooled and packaged, shall be used.

The metalizing equipment shall be set up, calibrated, and operated according to the manufacturer's instructions and technical manuals or the metalizing applicator's refinement thereto and as validated by the Job Reference Standard.

Spray parameters shall be set for spraying the specified thermal spray material and, at a minimum, be validated with the bend test. A bend test shall be satisfactorily performed at the beginning of crew and shift change.

A copy of the spray parameters used shall be attached to the Job Control Record.

C. SUBSTRATE CONDITION

The steel surface temperature shall be at least 5°F above the dew-point.

For flame spraying, preheat the initial starting area to a minimum of 250°F to prevent condensation of moisture in the flame onto the substrate. Validate preheating and non-preheating requirements with a tensile bond measurement and a bend test.

Time between the completion of the final anchor-tooth blasting (or final brush blasting) and the completion of the thermal spraying shall be no greater than six hours for steel substrates. In high-humidity and damp environments, shorter holding periods shall be used. If rust bloom or a

degraded coating appears at any time within the six-hour window, the procedure outlined in Section F, Surface or Coating Degradation shall be followed.

Extension of Time of Application

In low-humidity environments or in enclosed spaces using industrial dehumidification equipment, it will be possible to retard the oxidation of the steel and hold the surface finish for more than six hours. The metalizing applicator, with the approval of the DCES, can validate a holding period greater than six hours by determining the acceptable temperature-humidity envelope for the work enclosure by spraying and analyzing bend coupons and tensile-bond coupons.

A 1-mil to 2-mil flash coat of the metalizing may be applied within six hours of completing surface preparation to extend the holding period for up to four further hours beyond the complete application of the flash coat. The final metalizing thickness, however, shall be applied within four hours of the completion of the application of the flash coat provided the metalizing can be maintained free of contamination.

Validate the use of the flash TSC holding period with a tensile-bond measurement and a bend test.

- Clean and abrasive blast a representative job area and three bend-test coupons.
- Apply a flash metalizing to the representative job area and the three bend coupons.
- Wait the delay period in representative environmental conditions and apply the final metalizing thickness.
- Perform adhesion test and bend test on coupons.
- Flash metalizing and holding period are acceptable if the tensile bond and the bend test are satisfactory.

D. METALIZING

The applied 85/15 alloy metalizing thickness shall be a minimum of 12 mils, with a tolerance of -0 and + 4 mils. For each coated component, the applied thickness shall be measured using a SSPC PA2 type 2 fixed probe gauge properly calibrated per certified coating thickness calibration standards, and measurements shall be recorded in the Job Control Report (JCR). Use a measurement line to measure the peaks and valleys of the metalizing, taking the average value of five readings along a line at 1.0 in. intervals. For complex geometries and geometric transitions, use a measurement spot approximately 1.5 square inches, and do not measure the peaks and valleys of the metalized coating. Record all measurements in the JCR. If upon inspection, and prior to sealer application, the metalizing thickness is less than the above stated requirements, the applicator shall apply additional metalizing to meet the thickness requirements.

No coating shall be applied unless the following conditions are met:

- The receiving surface shall be clean and absolutely dry.
- The surface temperature and ambient air temperature are as recommended by the coating equipment’s manufacturer, except in no case shall coating work be performed when surface and ambient air temperatures are less than 40°F.

- The receiving surface temperature shall be at least 5°F above the dew point.
- The relative humidity shall not exceed 85%.

All coating applied in violation of these conditions shall be completely removed, and the affected surface cleaned and recoated in accordance with the stated requirements at no additional cost to the State.

Any staining that does occur shall be removed in a manner that does not cause damage to the seal or metalized coatings, at no cost to the State.

Surface Roughness: Surface roughness of the metalized coating shall be less than 4 mils in order to avoid unfilled valleys and low areas in the film.

E. SEALER

Sealer shall be applied and cured according to the paint manufacturer's instructions for use with metalizing, or as directed by the Engineer.

The seal coat shall be thin enough to penetrate into the body of the metalizing and seal the interconnected surface porosity. Typically the seal coat is applied at a spreading rate resulting in a theoretical 1.5 mil dry-film thickness.

Sealer shall be applied as soon as possible after thermal spraying, but shall be applied within eight hours after application of metalizing. If a sealer cannot be applied within eight hours, it shall be verified that the metalizing (a) has not been contaminated by visual inspection (10x), and (b) is dust-free (10x) using the clear cellophane tape test per ISO 8502-3 before applying the sealer.

If moisture is present or suspected in the pores of the metalizing, the steel shall be heated to 250 ^{o}F to remove the moisture prior to seal coat application. When possible, the steel shall be heated from the reverse side of the metalizing to minimize oxidation and contamination of the metalizing prior to sealing.

During application of the seal coat, it shall be visually validated that there was complete coverage of all intended areas. Companion steel coupons positioned near the metalizing shall receive a seal coat as well. The wet and dry film thicknesses of the seal coat on these companion coupons shall be used to verify that the correct thickness of seal coat is being applied to the metalizing. Measurements shall be recorded in the JCR.

The sealer shall not be applied to faying surfaces prior to assembly. Faying surfaces of all bolted connections shall be masked prior to application of the seal coat. Touch-up field sealant shall be applied after assembly of the connection.

F. SURFACE OR COATING DEGRADATION

If rust bloom, blistering or a degraded coating appears at any time during the application of the metalizing, the following procedure applies:

1. Stop spraying.
2. Mark off the satisfactorily sprayed area.
3. Call the Thermal Spray Inspector/Foreman to observe and evaluate the error.
4. Report the deficiency to the purchaser and record the deficiency.
5. Repair the unsatisfactory area by removing the degraded metalizing, re-blast to a minimum near-white metal finish (SSPC-SP 10 standard), and returning to the specified anchor tooth profile depth.
6. Recoat the blasted area as per this specification.
7. Record the actions taken to resume the job in the JCR.

G. FIELD REPAIRS

The only field work allowed to be done under this item is touch-up work after all steel erection and all concrete placement has been completed. All areas requiring field repairs shall be clearly marked. All the requirements of this specification shall apply to field coating material with the following modifications:

1. All dirt, grease and other foreign matter shall be removed in accordance with SSPC-SP 1, Solvent Cleaning. Clean the damaged area of all loose and cracked coating by power tool to bare metal in accordance with SSPC-SP 11, Power Tool Cleaning to Bare Metal.
2. Roughen the damaged area and the surrounding 2 inches to produce a suitable anchor for the coating. All repaired areas shall be tested for proper anchor tooth profile in accordance with ASTM D4417 and as per this specification.
3. All damage to the coating system shall be corrected by the contractor in accordance with the requirements of this specification and to the satisfaction of the Engineer at no additional cost to the State.
4. The overlap of thermal spray edges shall be tested for proper adhesion at each repair location in accordance with this specification.

H. ADHESION TEST

Random adhesion testing shall be performed for each coated component, utilizing self aligning portable pull-off adhesion testing equipment, in accordance with ASTM D 4541 standards. The minimum tensile bond value shall be 700 psi.

Use adhesive recommended by the instrument manufacturer, or equivalent. Attach adhesive manufacturer's instructions to the job control record.

One portable tensile-bond measurement shall be made every 500 ft^2. If the tensile bond is less than the contract specification, additional tensile bond measurements shall be made to identify the limits or boundaries of the degraded metalizing. The degree of added testing that is necessitated by coating deficiencies will be solely determined by the State, and shall be performed at no added cost to the State. Any degraded metalizing shall be removed and reapplied as per Section F, Surface or Coating Degradation. The tensile force shall be measured

to 700 psi. The tensile force shall then be reduced and the tensile fixture removed without damaging the metalizing.

I. BEND TEST

Conduct a bend test at the beginning of each work shift or crew change:

1. Use carbon steel coupons of approximate dimensions 2 in. x 4 in. to 8 in. x 0.050 in.
2. Surface preparation according to contract specification.
3. Spray 12-mil to 15-mil thick metalizing in crossing passes, laying down approximately 3 to 4 mils for each pass.
4. Bend coupons 180° around a 0.5-in. diameter mandrel.
   a. Bend test passes if there is no cracking or only minor cracks with no spalling or lifting (by a knife blade) from the substrate.
   b. Bend test fails if the coating cracks with lifting (by a knife blade) from the substrate.

   Bend test shall be performed on coupons without sealant coats.

J. WEATHER CONSIDERATIONS:

Thermal spraying in low-temperature environments (below freezing):

Substrate shall meet the surface temperature and holding period specified in Section C, Substrate Condition. No moisture or condensation is permissible on the surface during surface preparation and thermal spraying.

Qualify metalizing period with a tensile-bond measurement and a bend test. Meet the tensile bond and metallographic requirements specified herein.

METHOD OF MEASUREMENT

This work will be measured on a lump sum basis.

BASIS OF PAYMENT

The lump sum price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work.

Note: "nn" denotes a serialized pay item.

572.00020101	Metalizing, Type 1
572.00020201	Metalizing, Type 2
572.00020301	Metalizing, Type 3
572.00020401	Metalizing, Type 4
572.00020501	Metalizing, Type 5
572.00020601	Metalizing, Type 6

ITEM 603.95120011 – DUCTILE IRON PIPE ON CRUSHED STONE BEDDING, 12 IN DIA (NYC)
ITEM 603.95160011 – DUCTILE IRON PIPE ON CRUSHED STONE BEDDING, 16 IN DIA (NYC)
ITEM 603.95180011 – DUCTILE IRON PIPE ON CRUSHED STONE BEDDING, 18 IN DIA (NYC)
ITEM 603.95200011 – DUCTILE IRON PIPE ON CRUSHED STONE BEDDING, 20 IN DIA (NYC)
ITEM 603.95240011 – DUCTILE IRON PIPE ON CRUSHED STONE BEDDING, 24 IN DIA (NYC)

DESCRIPTION

This work shall consist of the construction of ductile iron pipe storm drains in accordance with this specification and the contract plans.

MATERIALS

Ductile iron pipe shall be Class 56 unless otherwise indicated and meet the requirements of ANSI A21.51. Pipe shall be centrifugally cast Ductile Iron Pipe, 60-42-10 grade cement lined in accordance with ANSI A21.51. Laying lengths shall not exceed twenty (20) feet. All inside surfaces of ductile, iron pipes shall be cement lined in accordance with ANSI specification A21.4. All outside surfaces of ductile iron pipe shall be shop-coated with an approved bituminous enamel applied hot in conformity with AWWA specification 203.

Joints shall be of the restrained push-on type and shall be in accordance with ANSI specification A21.11. The joint shall provide a positive axial lock between the two pipe segments joined. For each bell, there shall be furnished a rubber gasket. Restrained push-on joints shall be the TRFlex Joint of U.S. Pipe and Foundry Company, the Flex Ring Joint of the American Cast Iron Company, the Snap Lok Joint of Amstead Industries or approved equal.

Ductile Iron Pipe shall be accepted on the basis of the Manufacturer's certification that the material conforms to the requirements of this specification. The certification shall accompany the material delivered to the job site.

Broken stone shall be hard, unweathered stone uniformly graded from ¼ inch to 3/4 inch diameter and shall conform to the requirements of Subsection 703-02 of the Standard Specifications (USC Edition).

CONSTRUCTION DETAILS

Pipe shall be laid on a bed of compacted stone for the full trench width to the limits shown on the details of the drawings. Pipe joints shall be restrained push-on type and shall be installed in accordance with the manufacturer's instructions for assembling pipe. All other requirements of Subsection 603-3 "Construction Details" of the Standard Specifications (USC Edition) shall apply.

METHOD OF MEASUREMENT

The quantities of Ductile Iron Pipe on Crushed Stone Bedding to be measured for payment shall be the number of linear feet of each sized measured horizontally along the center line of sewer from inside face of manhole to inside face of manhole.

ITEM 603.95120011 – DUCTILE IRON PIPE ON CRUSHED STONE BEDDING, 12 IN DIA (NYC)
ITEM 603.95160011 – DUCTILE IRON PIPE ON CRUSHED STONE BEDDING, 16 IN DIA (NYC)
ITEM 603.95180011 – DUCTILE IRON PIPE ON CRUSHED STONE BEDDING, 18 IN DIA (NYC)
ITEM 603.95200011 – DUCTILE IRON PIPE ON CRUSHED STONE BEDDING, 20 IN DIA (NYC)
ITEM 603.95240011 – DUCTILE IRON PIPE ON CRUSHED STONE BEDDING, 24 IN DIA (NYC)

BASIS OF PAYMENT

The requirements of Subsection 603-5 "Basis of Payment" of the Standard Specifications (USC Edition) shall apply. The broken stone bedding shall be paid for separately under Item 623.13 Crushed Stone.

ITEM 603.95320011 - DUCTILE IRON PIPE, 12-INCH DIAMETER (NYC)
ITEM 603.95360011 - DUCTILE IRON PIPE, 16-INCH DIAMETER (NYC)
ITEM 603.95380011 - DUCTILE IRON PIPE, 20-INCH DIAMETER (NYC)
ITEM 603.95440011 - DUCTILE IRON PIPE, 24-INCH DIAMETER (NYC)

DESCRIPTION: This work shall consist of the construction of ductile iron pipe storm drains in accordance with this specification and the contract plans.

MATERIALS: Ductile iron pipe shall be Class 56 unless otherwise indicated and meet the requirements of ANSI A21.51. Pipe shall be centrifugally cast Ductile Iron Pipe. 60-42 -10 grade cement lined in accordance with ANSI A21.51. Laying lengths shall not exceed twenty (20) feet. All outside surfaces of ductile iron pipes shall be cement lined in accordance with ANSI specification A21.4. All outside surfaces of ductile iron pipe shall be shop-coated with an approved bituminous enamel applied hot in conformity with AWWA specification 203.

Joints shall be of the restrained push-on type and shall be in accordance with ANSI specification A21.11. The joint shall provide a positive axial lock between the two pipe segments joined. For each bell, there shall be furnished a rubber gasket. Restrained push on joints shall be the TRFlex Joint of U.S. Pipe and Foundry Company, The Flex Ring Joint of the American Cast Iron Company, The Snap Lok Joint of Amslead Industries or approved equal.

Ductile Iron Pipe shall be accepted on the basis of the Manufacturer's certification that the material conforms to the requirements of this specification. The certification shall accompany the material delivered on the job site.

CONSTRUCTION DETAILS: Pipe shall be laid on a cast-in-place concrete cradle as shown on the details in the drawings. Pipe joints shall be restrained push-on type and shall be installed in accordance with the manufacturer's instructions for assembling pipe. All other requirements of Subsection 605-3 "Construction Details" of the Standard Specifications (US Customary Units) shall apply.

METHOD OF MEASUREMENT: The quantities of Ductile Iron Pipe to be measured for payment shall be the number of linear feet of each size of pipe furnished and incorporated in the work, measured horizontally along the center line of pipe from inside face of drainage structure to inside face of drainage structure

BASIS OF PAYMENT: The requirements of Subsection 603-5 "Basis of Payment" of the Standard Specifications (US Customary Units) shall apply. The concrete cradle shall be paid for separately under item 555.0104 Footing Concrete, Class "A".

3/14/96
Converted to USC 11/30/2010

ITEM 604.02010011 - CATCH BASIN - TYPE 1 (NEW YORK CITY)
ITEM 604.02020011 - CATCH BASIN - TYPE 2 (NEW YORK CITY)
ITEM 604.02030011 - CATCH BASIN - TYPE 3 (NEW YORK CITY)

DESCRIPTION**:** This work shall consist of the construction of Catch Basins - Type 1, Type 2 and Type 3 (New York City) at the locations shown on the plans or as directed by the Engineer.

MATERIALS: Section 604-2.01 of the Standard Specifications shall apply with the following modifications and an addition: Catch Basins shall be built of Cast-in-Place Concrete - Class A or rectangular Precast Reinforced Concrete Manhole Units.

CONSTRUCTION DETAILS: Section 604-3.01, 3.02, 3.05 and 3.11 of the Standard Specifications shall apply. Catch Basins - Type 1, Type 2 and Type 3 shall be as shown on New York City Department of Water Resources Drawings T71, T72 and New York City Department of Environmental Protection Drawing 42, respectively, except that concrete cradles and encasement for pipes will not be required.

METHOD OF MEASUREMENT: Section 604-4.01 of the Standard Specifications shall apply.

BASIS OF PAYMENT: Section 604-5 of the Standard Specifications shall apply with the following additions:
A. Hooks and Hoods. Hooks and Hoods, when called for on the plans, will be paid for separately.
B. Plugging Pipes. The cost of all materials and labor necessary to plug pipe as called for on the plans shall be included in the price bid for "Plugging Pipes and Conduits."

Rev. 07/1995
12/1999
USC 05/2010

ITEM 604.04020011 - NYC STANDARD FOR 4 FOOT DIAMETER PRECAST MANHOLE

DESCRIPTION
This work shall consist of the construction of 4 Foot Diameter Precast Manholes (NYC) at the locations shown on the plans or as directed by the Engineer.

MATERIALS
Section 604-2.01 of the Standard Specifications shall apply with the following modification and or addition:
Manholes shall be built of circular Precast Reinforced Class "A" Concrete Manhole Units.

CONSTRUCTION DETAILS
Section 604-3.01, 3.02, 3.05 and 3.11 of the Standard Specifications shall apply.
Manholes shall be as shown on the following New York City Department of Environmental Protection SEWER DESIGN STANDARDS, (October 1997 or later).
Page Drawing Description
28A NYC STANDARD FOR 4 FOOT DIAMETER PRECAST MANHOLE
(LOOSE TOP SLAB AND MONOLITHIC BASE SECTION)
28B NYC STANDARD FOR 4 FOOT DIAMETER PRECAST MANHOLE
(MONOLITHIC TOP SECTION AND ALTERNATE LOOSE BOTTOM SLAB)
28C NYC STANDARD FOR 4 FOOT DIAMETER PRECAST MANHOLE
(MISCELLANEOUS DETAIL, NOTES AND SCHEDULE)

METHOD OF MEASUREMENT
The quantity to be paid for will be the number of linear feet of height measured to the nearest tenth of a foot from the bottom of the base to the top of the masonry.

BASIS OF PAYMENT
The unit price bid per linear feet shall include the cost of all labor, equipment and materials necessary to complete the work, except as follows:

A. Necessary excavation will be paid for under Trench and Culvert excavation.
B. Bar reinforcement (except in reinforced concrete pipe and precast reinforced concrete units) will be paid for under Uncoated Bar Reinforcement for Concrete Structures.
C. Frames, covers, and gratings will be paid for under the appropriate items.
D. Temporary sheeting, if necessary, will be paid for under their appropriate items.

Rev. 10/2002
USC 04/2010

ITEM 604.04030011 – NYC STANDARD FOR 5 FOOT DIAMETER PRECAST MANHOLE

DESCRIPTION

This work shall consist of the construction of 5 Foot Diameter Precast Manholes (NYC) at the locations shown on the plans or as directed by the Engineer.

MATERIALS

Section 604-2.01 of the Standard Specifications shall apply with the following modification and or addition:

Manholes shall be built of circular Precast Reinforced Concrete Manhole Units.

CONSTRUCTION DETAILS

Section 604-3.01, 3.02, 3.05 and 3.11 of the Standard Specifications shall apply.

Manholes shall be as shown on the following New York City Department of Environmental Protection SEWER DESIGN STANDARDS, (September 2007 or later).

Page	Drawing Description
29A	NYC STANDARD FOR 5 FOOT DIAMETER PRECAST MANHOLE (LOOSE TOP SLAB AND MONOLITHIC BASE SECTION)
29B	NYC STANDARD FOR 5 FOOT DIAMETER PRECAST MANHOLE (MONOLITHIC TOP SECTION AND ALTERNATE LOOSE BOTTOM SLAB)
29C	NYC STANDARD FOR 5 FOOT DIAMETER PRECAST MANHOLE (MISCELLANEOUS DETAIL, NOTES AND SCHEDULE)

METHOD OF MEASUREMENT

The quantity to be paid for will be the number of linear feet of height measured to the nearest tenth of a foot from the bottom of the base to the top of the masonry.

BASIS OF PAYMENT

The unit price bid per linear foot shall include the cost of all labor, equipment and materials necessary to complete the work, except as follows:

A. Necessary excavation will be paid for under Trench and Culvert excavation.

10/10/02
Rev. 06/09/14

B. Bar reinforcement (except in reinforced concrete pipe and precast reinforced concrete units) will be paid for under Uncoated Bar Reinforcement for Concrete Structures.

C. Frames, covers, and gratings will be paid for under the appropriate items.

D. Temporary sheeting, if necessary, will be paid for under their appropriate items.

ITEM 604.04040011 - NYC STANDARD FOR 6 FOOT DIAMETER PRECAST MANHOLE
ITEM 604.04050011 – NYC STANDARD FOR 7 FOOT DIAMETER PRECAST MANHOLE
ITEM 604.04060011 – NYC STANDARD FOR 8 FOOT DIAMETER PRECAST MANHOLE
ITEM 604.04070011 – NYC STANDARD FOR 10 FOOT DIAMETER PRECAST MANHOLE

DESCRIPTION

This work shall consist of the construction of 6'-0", 7'-0", 8'-0" and 10'-0" foot diameter precast manholes (NYC) at the locations shown on the plans or as directed by the Engineer.

MATERIALS

Section 604-2.01 of the Standard Specifications shall apply with the following modification and or addition:

Manholes shall be built of circular Precast Reinforced Concrete Manhole Units.

CONSTRUCTION DETAILS

Section 604-3.01, 3.02, 3.05 and 3.11 of the Standard Specifications shall apply.

Manholes shall be as shown on the following New York City Department of Environmental Protection SEWER DESIGN STANDARDS, (January 2009 or current edition).

Page	Drawing Description
SE30A	STANDARD FOR PRECAST MANHOLE (DWG. 1 OF 4) (FOR 6'-0", 7'-0", 8'-0" AND 10'-0" DIA. PRECAST MANHOLE) (LOOSE TOP SLAB AND MONOLITHIC BASE SECTION)
SE30B	STANDARD FOR PRECAST MANHOLE (DWG. 2 OF 4) (FOR 6'-0", 7'-0", 8'-0" AND 10'-0" DIA. PRECAST MANHOLE) (MONOLITHIC TOP SECTION AND ALTERNATE LOOSE BOTTOM SLAB)
SE30C	STANDARD FOR PRECAST MANHOLE (DWG. 3 OF 4) (FOR 6'-0", 7'-0", 8'-0" AND 10'-0" DIA. PRECAST MANHOLE) (PRECAST MANHOLE MISCELLANEOUS DETAIL, NOTES AND SCHEDULES)
SE30D	STANDARD FOR PRECAST MANHOLE (DWG. 4 OF 4) (FOR 6'-0", 7'-0", 8'-0" AND 10'-0" DIA. PRECAST MANHOLE)

ITEM 604.04040011 - NYC STANDARD FOR 6 FOOT DIAMETER PRECAST MANHOLE
ITEM 604.04050011 – NYC STANDARD FOR 7 FOOT DIAMETER PRECAST MANHOLE
ITEM 604.04060011 – NYC STANDARD FOR 8 FOOT DIAMETER PRECAST MANHOLE
ITEM 604.04070011 – NYC STANDARD FOR 10 FOOT DIAMETER PRECAST MANHOLE

METHOD OF MEASUREMENT

The quantity to paid for will be the number of linear feet of height measured to the nearest tenth of a foot from the bottom of the base to the top of the masonry.

BASIS OF PAYMENT

The unit price bid per linear foot shall include the cost of all labor, equipment and materials necessary to complete work, except as follows:

A. Necessary excavation will be paid for under Trench and Culvert excavation.

B. Bar reinforcement (except in reinforced concrete pipe and precast reinforced concrete units) will be paid for under Uncoated Bar Reinforcement for Concrete Structures.

C. Frames, covers, and gratings will be paid for under the appropriate items.

D. Temporary sheeting, if necessary, will be paid for under their appropriate items.

ITEM 604.04850011 – NYC STANDARD MANHOLE TYPE A-1
ITEM 604.04860011 – DROP PIPE MANHOLE (NYC)

DESCRIPTION

This work shall consist of the construction of manholes – Type A-1 (NYC) and Drop Pipe Manholes (NYC) at the locations shown on the plans or as directed by the Engineer.

MATERIALS

Section 604-2.01 of the Standard Specifications shall apply with the following modification and an addition:

Manholes shall be built of Cast-in-Place Concrete - Class "A" or rectangular Precast Reinforced Concrete Manhole Units.

CONSTRUCTION DETAILS

Section 604-3.01, 3.02, 3.05 and 3.11 of the Standard Specifications shall apply.

Manholes shall be as shown on the following New York City Department of Environmental Protection SEWER DESIGN STANDARDS (September 2007 or later).

Page	Drawing Description
11	STANDARD FOR MANHOLE ON 8" DIA. TO 30" DIA. PIPE SEWERS IN DRY LOCATION, TYPE A-1 (12' MAX. COVER) AND TYPE A-2 (25' MAX. COVER)
35	STANDARD FOR REMOVABLE PRECAST REINFORCED CONCRETE SLAB
24	STANDARD FOR DROP PIPE MANHOLE (TYPE I) ON 10" DIA. TO 24" DIA. PIPE SEWERS (25' MAX. COVER)
36	STANDARD FOR REMOVABLE PRECAST REINFORCED CONCRETE SLAB FOR DROP PIPE MANHOLE (TYPE I)

METHOD OF MEASUREMENT

The quantity to be paid for will be the number of linear feet of height measured to the nearest tenth of a foot from the bottom of the base to the top of the masonry.

Rev 7/95, 12/99
Rev 07/09/14

ITEM 604.04850011 – NYC STANDARD MANHOLE TYPE A-1
ITEM 604.04860011 – DROP PIPE MANHOLE (NYC)

BASIS OF PAYMENT

The unit price bid per linear foot shall include the cost of all labor, equipment and materials necessary to complete the work, except as follows:

A. Necessary excavation will be paid for under Trench and Culvert excavation.

B. Bar reinforcement (except in reinforced concrete pipe and precast reinforced concrete units) will be paid for under Uncoated Bar Reinforcement for Concrete Structures.

C. Frames, covers, and gratings will be paid for under the appropriate items.

D. Safe operation and temporary steel sheet piling, if necessary, will be paid for under their appropriate items.

Rev 7/95, 12/99
Rev 07/09/14

ITEM 604.04890011 – NYC STANDARD MANHOLE TYPE A-3

DESCRIPTION

This work shall consist of the construction of manholes – Type A-3 (NYC) at the locations shown on the plans or as directed by the Engineer.

MATERIALS

Section 604-2.01 of the Standard Specifications shall apply with the following modification and addition:

Manholes shall be built of Cast-in-Place Concrete - Class "A" or rectangular Precast Reinforced Concrete Manhole Units.

CONSTRUCTION DETAILS

Section 604-3.01, 3.02, 3.05 and 3.11 of the Standard Specifications shall apply.

Manholes shall be as shown on the following New York City Department of Environmental Protection SEWER DESIGN STANDARDS (September 2007 or later).

Page	Drawing Description
13	STANDARD FOR SHALLOW MANHOLE ON 8 INCH DIA TO 30 INCH DIA PIPE SEWERS, TYPE A-3 (LESS THAN 4'-0" COVER)
35	STANDARD FOR REMOVABLE PRECAST REINFORCED CONCRETE SLAB

METHOD OF MEASUREMENT

The quantity to be paid for will be the number of linear feet of height measured to the nearest tenth of a foot from the bottom of the base to the top of the masonry.

BASIS OF PAYMENT

The unit price bid per linear foot shall include the cost of all labor, equipment and materials necessary to complete the work, except as follows:

A. Necessary excavation will be paid for under Trench and Culvert excavation.

B. Bar reinforcement (except in reinforced concrete pipe and precast reinforced concrete units) will be paid for under Uncoated Bar Reinforcement for Concrete Structures.

C. Frames, covers, and gratings will be paid for under the appropriate items.

D. Safe operation and temporary steel sheet piling, if necessary, will be paid for under their appropriate items.

ITEM 609.26020111 – CONCRETE CURB, STEEL FACED (NYC), TYPE D

DESCRIPTION:

Under this item the Contractor shall construct concrete curb with steel facing as illustrated on the plans, in accordance with these specifications, at the locations shown on the plans or as ordered by the Engineer.

MATERIALS

1. The material requirements of Section 609 "Curb and Curb & Gutter" of the Standard Specifications shall apply. The material requirements, mix preparations and manufacturing of concrete shall comply with the Standard Specification for Class A concrete in Section 501, "Portland Cement Concrete - General".

2. Structural steel shall conform to the requirements of ASTM Designation A283, Grade A, and shall meet the requirement of the "New York Steel Construction Manual".

3. Epoxy Primer, Epoxy Intermediate Coat and Polyurethane Topcoat shall meet the requirements of Item 572.01nnnn Structural Steel Painting, Shop Applied. The Polyurethane Topcoat shall be light gray in color such that a prepared chip shall be a reasonable visual match to Munsell Book Notation 10B 6/1. Viewing shall be done North Standard Daylight.

CONSTRUCTION DETAILS:

Fabrication and construction details comply with the detail and notes on the New York City Department of Highways standard drawing H-1010 "Steel Faced Curb . . . Type D", as applicable with these specifications, and in accordance with the following:

A. Concrete Curb

1. Sub-section 609-3.04 "A. Conventionally Formed Curb and Curb & Gutter" of the Standard Specifications for construction of concrete curb shall apply except as modified by this specification.

2. Expansion joints for curb section shall be 9/32 inch wide and filled with Premoulded Bituminous Joint Filler. An expansion joint of 3/4 inch thick Premoulded Bituminous Joint filler shall be provided in the curb on each side of drainage structures.

3. All the provisions of Section 609 pertaining to "Curb and Curb & Gutter" shall apply.

B. Steel Facing

1. Fabrication of the steel facing shall conform to the requirements of Subsections 564-3 "Construction Details" of the Standard Specifications.

2. All surfaces of completed steel facing including anchors, fastening, etc., shall be thoroughly cleaned of all rust, oil, grease or foreign matter in accordance with Item 572.01nnnn Structural Steel Paint, Shop Applied. All surfaces of steel facing to be exposed after installation shall be painted in accordance with and meet the requirements of items 574.02nnnn and 574.03nnnn.

ITEM 609.26020111 – CONCRETE CURB, STEEL FACED (NYC), TYPE D

3. Curved steel facing shall be bent to radii designated on the plans, with tangent 36 inch lengths provided in the end sections that will incorporate the point of curvature and point of tangency of the curb radius.

4. Special steel facing for drop curbs, splays, etc., shall be constructed as indicated on the New York City Highway Drawing H-1015 “Steel Faced Drop Curb (Driveways)”.

METHOD OF MEASUREMENT

Measurement will be taken as the number of linear feet of steel faced concrete curb furnished and installed where shown on the plans as ordered by the Engineer.

BASIS OF PAYMENT

The unit price bid per linear feet shall include the cost of furnishing all labor, materials, equipment, excavation to bed the curb, and backfill, except where select backfill is called for, necessary to satisfactorily complete the work. Cleaning and painting of steel facing shall be included in the unit price bid.

ITEM 609.26520011 - STEEL FACING FOR CURB ON STRUCTURE (NYC), TYPE D

DESCRIPTION

Under this item, the contractor shall supply and install steel facing for curb on structure at the locations indicated on the plans.

MATERIALS

A. Structural Steel shall conform to the requirements of ASTM Designation A283M, Grade A, and shall meet the requirements of the New York State Steel Construction Manual.

B. Epoxy primer, Epoxy Intermediate Coat and Polyurethane Topcoat shall meet the requirements of Item 572.01 Structural Steel Paint systems: Shop Applied, except shop inspection for painting is not required. The Polyurethane topcoat shall be light gray in color such that a prepared chip shall be a reasonable visual match to Munsell Book Notation 10B 6/1. Viewing shall be done under North Standard Daylight.

C. Concrete grouting material shall meet the requirements of subsection 701-05.

CONSTRUCTION DETAILS

Fabrication details shall comply with the details and note on the New York city Department of Highways Standard Drawing H-1043 ASteel Faced Curb For Structures@ and with the following:

A. Fabrication of the steel facing shall conform to the requirements of the New York State Steel Construction Manual. All surfaces of completed steel facing, including anchors, fastenings, etc., shall be thoroughly cleaned of all rust, oil, grease, scale, or foreign matter in accordance with the requirements of SSPC-SP6 prior to painting.

B. All surfaces of steel facing, which remain exposed after installation shall be painted with three coats of paint as described in Paragraph B, Materials, above. Finish coat color shall be light gray, conforming to Munsell Book Notation 10B 6/1. Viewing shall be done under North Standard Daylight.

C. Concrete Grouting Material, if required shall be placed adjacent to the steel facing in locations shown on the Plans.

ITEM 609.26520011 - STEEL FACING FOR CURB ON STRUCTURE (NYC), TYPE D

METHOD OF MEASUREMENT

The quantity to be paid will be the number of feet of steel facing actually installed.

BASIS OF PAYMENT

The unit price bid per foot shall include the cost of all the materials and labor necessary to install the steel facing and concrete grouting material. The cost of furnishing and placing concrete and forming of the recess, if required, are included in the appropriate concrete items.

ITEM 610.16010139 - ESTABLISHING TURF WITH ENDOPHYTES (PANYNJ)

DESCRIPTION

The work shall consist of furnishing, installing and establishing turf with endophytes in accordance with the contract documents and as directed by the Engineer.

This item incorporates all the requirements described in the following specifications from the Port Authority of New York and New Jersey (PANYNJ), which are included in a Special Note entitled: "Establishing Turf with Endophytes (PANYNJ)":

Division 2, Section 02920—"Soil Testing"
Division 2, Section 02930—"Seeding (New York)"
Division 2, Section 02936—"Hydraulically-Applied Erosion Control: High Performance Flexible Growth Medium"
Division 2, Section 02960—"Adding Compost"

MATERIALS

As per PANYNJ requirements included in the contract documents.

CONSTRUCTION DETAILS

As per PANYNJ requirements included in the contract documents.

METHOD OF MEASUREMENT

This work will be measured by the number of square yards, measured to the nearest whole square yard on-slope, of turf with endophytes satisfactorily furnished, installed and established.

BASIS OF PAYMENT

The unit price bid per square yard of turf with endophytes furnished, installed and established shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work including all testing and analysis, soil preparation and amendments, mulch, quality assurance and submittals.

ITEM 611.19010024 - POST-PLANTING CARE WITH REPLACEMENT - MAJOR DECIDUOUS TREES
ITEM 611.19020024 - POST-PLANTING CARE WITH REPLACEMENT - MINOR DECIDUOUS TREES
ITEM 611.19030024 - POST-PLANTING CARE WITH REPLACEMENT - CONIFEROUS TREES
ITEM 611.19040024 - POST-PLANTING CARE WITH REPLACEMENT - DECIDUOUS SHRUBS
ITEM 611.19050024 - POST-PLANTING CARE WITH REPLACEMENT - EVERGREEN SHRUBS
ITEM 611.19060024 - POST-PLANTING CARE WITH REPLACEMENT– VINES, GROUNDCOVERS
ITEM 611.19070024 - POST-PLANTING CARE WITH REPLACEMENT - HERBACEOUS PLANTS

DESCRIPTION

This work consists of the care of newly planted and transplanted trees, shrubs, vines, groundcovers and other plants and replacement of plants in kind and as necessary, in accordance with the contract documents and as directed by the Engineer.

MATERIALS

Materials shall meet the requirements of the following subsections of Section 700 *Materials and Manufacturing*.

Water	712-01
Topsoil	713-01
Mulch for Landscape Bedding	713-05
Trees, Shrubs and Vines	713-06
Materials for the Protection of Plants	713-08
Pesticides	713-13

CONSTRUCTION

Post-Planting Care. The Contractor shall perform all work as specified under Standard Specification section **611-3.05 Post-Planting Care.**

Replacement Planting. Plants that die, become diseased or badly impaired during Post-Planting Care shall be removed and replaced in kind once with new, healthy plant material, in the same location as the initial planting. Replacement planting shall occur within the planting seasons shown in Standard Specification **Table 611-1**. For any plants replaced during the Post-Planting Care period, Post-Planting Care shall continue to the end of the period.

Replacement plants shall be planted, maintained and accepted per Standard Specification **Section 611-3.01.** Planting soil used in the initial planting shall be reused for replacement plants and shall be supplemented with topsoil at no additional cost if additional material is needed to meet grade and surface finish. Watering shall accompany backfilling, at no additional cost. No replacement tree shall be staked, guyed or anchored.

ITEM 611.19010024 - POST-PLANTING CARE WITH REPLACEMENT - MAJOR DECIDUOUS TREES
ITEM 611.19020024 - POST-PLANTING CARE WITH REPLACEMENT - MINOR DECIDUOUS TREES
ITEM 611.19030024 - POST-PLANTING CARE WITH REPLACEMENT - CONIFEROUS TREES
ITEM 611.19040024 - POST-PLANTING CARE WITH REPLACEMENT - DECIDUOUS SHRUBS
ITEM 611.19050024 - POST-PLANTING CARE WITH REPLACEMENT - EVERGREEN SHRUBS
ITEM 611.19060024 - POST-PLANTING CARE WITH REPLACEMENT– VINES, GROUNDCOVERS
ITEM 611.19070024 - POST-PLANTING CARE WITH REPLACEMENT - HERBACEOUS PLANTS

METHOD OF MEASUREMENT.

The quantity to be measured for payment will be the number of plants of each type cared for and, if necessary, replaced in kind.

BASIS OF PAYMENT.

The unit price bid shall include the cost of all labor, materials, and equipment necessary to satisfactorily complete the work.

Payment will be made under:

Item No.	Item	Pay Unit
611.19010024	Post Planting Care with Replacement - Major Deciduous Trees	Each
611.19020024	Post Planting Care with Replacement - Minor Deciduous Trees	Each
611.19030024	Post Planting Care with Replacement - Coniferous Trees	Each
611.19040024	Post Planting Care with Replacement - Deciduous Shrubs	Each
611.19050024	Post Planting Care with Replacement - Evergreen Shrubs	Each
611.19060024	Post Planting Care with Replacement– Vines, Groundcovers	Each
611.19070024	Post Planting Care with Replacement - Herbaceous Plants	Each

ITEM 613.70XX0011 - BIRD REPELLANT SYSTEM

DESCRIPTION

This work shall consist of furnishing and installing a bird repellant system(s), at the locations indicated in the contract documents, in accordance with the contract documents, and as directed by the Engineer.

MATERIALS

Bird repellant spike, coil, or netting systems, shall be from the following manufacturers:

Bird-Flite
as manufactured by
Bird Barrier America Inc.,
20925 Chico Street
Carson, CA 90746
310-527-8000
https://birdbarrier.com

Spikes System
as manufactured by
BIRD-X Inc.,
300 N Oakley Blvd
Chicago, IL 60612
1-800-662-5021
www.bird-x.com

Bird Coil
as manufactured by
Bird Barrier America, Inc.
20925 Chico Street
Carson, CA 90746
310-527-8000
https://birdbarrier.com

Bird Coil Bird Repellent
as manufactured by
Bird Busters
707 South Gulfstream Avenue #405
Sarasota, FL 34236
866-915-8225
www.birdbusters.com

StealthNet System
as manufactured by
Bird Barrier America Inc.
20925 Chico Street
Carson, CA 90746
310-527-8000
https://birdbarrier.com

Bird Netting
as manufactured by
BIRD-X, Inc.
300 N Oakley Blvd.
Chicago, IL 60612
1-800-662-5021
www.bird-x.com

ITEM 613.70XX0011 - BIRD REPELLANT SYSTEM

	Avi Angle
BirdSlide	
as manufactured by	as manufactured by
Bird Barrier America Inc	BIRD-X Inc.
20925 Chico Street	300 N Oakley Blvd.
Carson, CA 90746	Chicago, IL 60612
370-527-8000	1-800-662-5021
https://birdbarrier.com	www.bird-x.com

or equal as approved by the Engineer

Bird repellant systems shall be attached to structural steel and concrete surfaces through the use of adhesive compounds recommended by the manufacturer of the approved system.

CONSTRUCTION DETAILS

The Bird Repellant Systems shall be installed in strips. Refer to the contract documents for additional information/details.

Horizontal and sloped surfaces underneath bridge superstructures that may be used as nesting sites shall be protected.

The adhesive compound shall be applied in accordance with the manufacturer's specifications. Recommendations regarding the adhesive compounds' drying time, if any, shall be strictly followed.

Care shall be taken that all required surfaces are covered. Netting systems shall be installed to provide complete enclosures of the undersides of bridge superstructures.
The Contractor shall not drill holes in any structural steel or concrete for this application without

the written permission.

METHOD OF MEASUREMENT

This work will be measured:

- as the total **linear feet** of bird repellant systems (spike or wire coil) satisfactorily installed in accordance with this specification, OR
- as the total **square feet** of bird repellant system, netting satisfactorily installed in accordance with this specification.

BASIS OF PAYMENT

The unit price bid per linear foot or square foot of bird repellant system (spike or netting), shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work.

Payment will be made under:

Pay Item	Description	Unit
613.70010011	Bird Repellant System, Single Row Spike	Feet
613.70020011	Bird Repellant System, Double Row Spikes	Feet
613.70030011	Bird Repellant System, Triple Row Spikes	Feet
613.70040011	Bird Repellant System, Triple Row Extra Wide Spikes	Feet
613.70050011	Bird Repellant System, Wire Coils	Feet
613.70060011	Bird Repellant System, Netting	Square Feet
613.70070011	Bird Repellant System, Sliders	Feet

ITEM 619.10040020 - PORTABLE WORK ZONE CAMERA

DESCRIPTION

This work shall furnish, install, maintain, operate, and remove Portable Work Zone Camera(s) in accordance with the contract documents and as directed by the Engineer.

MATERIALS

Required is a compact, robust and fully integrated solid-state day/night camera that will be used to capture full view, high resolution images of vehicles traveling through the work zone in a single lane and/or multiple lane application in all types of weather scenarios including bright sunlight, low light and adverse conditions or inclement weather situations experienced in the northeast United States.

At a minimum, the camera shall have the following characteristics:

- The ability to record 24 hours a day, 7 days a week during construction.
- Loop recording with a minimum of 2 hours of 1440p video storage before re-writing the loop. Storage shall be in the form of a removable SD card and there shall be backup storage, with the same requirements.
- 2560 x 1440 Resolution
- 30 frames per second (fps)
- H.264 and Motion JPEG video encoding
- Video Stabilization

CONSTRUCTION DETAILS

The camera shall be secured to either the front or back of a construction vehicle or on a tripod and have full view of oncoming or departing traffic, as per contractor judgement with approval from the Engineer In Charge. The camera shall capture a direct front or rear view of oncoming or departing vehicles.

If there is any work zone intrusion, hostile encounter or other event police are called to the construction site, the Contractor will remove the storage once police arrive on the scene and hand over the storage to the EIC or another NYSDOT representative. The Contractor will immediately replace the removable storage and turn on the camera again.

Work Zone Camera advance warning signs shall be installed within the Work Zone in accordance with the contract documents.

Installation shall include procurement, mounting of camera, memory, and testing, including replacement of any systems that fail prior to the end of the performance period. During the warranty period, the Contractor will be required to perform all remedial or replacement work necessary to maintain satisfactory performance of the camera.

ITEM 619.10040020 - PORTABLE WORK ZONE CAMERA

METHOD OF MEASUREMENT

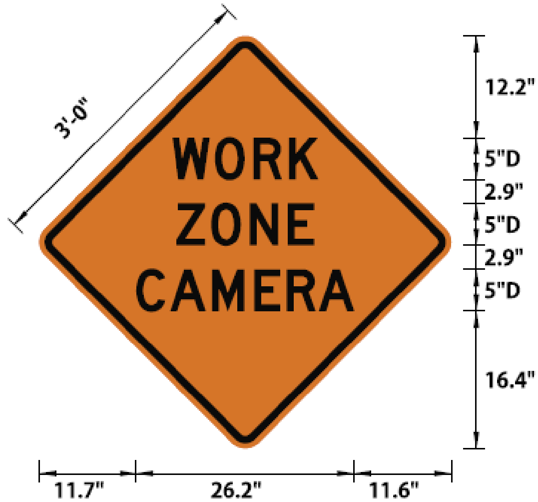
This quantity will be the number of cameras satisfactorily furnished, installed, maintained, operated, and removed.

BASIS OF PAYMENT

The cost of advance warning signs shall be included in the unit bid price for Item 619.01 – *Basic Work Zone Traffic Control*. Any additional SD cards needed will be paid for under 637.34 – *Office Technology and Supplies*. The unit price bid shall include the cost of all labor, materials and equipment necessary to satisfactorily complete the work.

ITEM 619.10040020 - PORTABLE WORK ZONE CAMERA

SIGN DETAIL
1:20



BORDER
R=1.625"
TH=0.875"
IN=0.625"

Dimensions are in inches. tenths   Letter locations are panel edge to lower left corner

NEW YORK STATE OF OPPORTUNITY. Department of Transportation	MO Traffic
LOCATION NUMBER(S):	
MUTCD NUMBER:	
WIDTH X HEIGHT: 4'-1" x 4'-1"	
SIGN AREA: 17.0 Sq. Ft.	
MOUNTING: Ground	
BACKGROUND COLOR: Orange	
LEGEND/BORDER COLOR: Black/Black	

SYMBOL	ROT	X	Y	WID	HT

LETTER POSITIONS (X)						LENGTH	SERIES/SIZE
W	O	R	K				D 2000
16	21.1	25.7	30			17.5	5
Z	O	N	E				D 2000
16.5	20.6	25.3	29.9			16.5	5
C	A	M	E	R	A		D 2000
11.7	15.7	20.7	25.8	29.8	33.6	26.2	5

ITEM 619.10040020 - PORTABLE WORK ZONE CAMERA

SIGN DETAIL
1:40

BORDER
R=3"
TH=1.25"
IN=0.75"

Panel Style: warning-orange-48x48.ssi
Dimensions are in inches. tenths Letter locations are panel edge to lower left corner

NEW YORK STATE OF OPPORTUNITY. Department of Transportation	MO TRAFFIC
LOCATION NUMBER(S):	
MUTCD NUMBER:	
WIDTH X HEIGHT: 5'-5" x 5'-5"	
SIGN AREA: 29.2 Sq.Ft.	
MOUNTING: Ground	
BACKGROUND COLOR: Orange	
LEGEND/BORDER COLOR: Black/Black	

SYMBOL	ROT	X	Y	WID	HT

LETTER POSITIONS (X)

W	O	R	K																							LENGTH	SERIES/SIZE
20.1	27.3	33.8	39.7																								D 2000
																										24.5	7
Z	O	N	E																								D 2000
20.8	26.7	33.2	39.6																							23.1	7
C	A	M	E	R	A																						D 2000
14.1	19.8	26.8	33.9	39.4	44.8																					36.6	7

ITEM 619.10040020 - PORTABLE WORK ZONE CAMERA

TMI 20-01 PILOT WORK ZONE CAMERA POLICY - ADDENDUM 2

Notes:

1. This supplement shall be used in conjunction with the requirements of the appropriate Temporary Traffic Control Plan, including advance warning signs, protective vehicles and channelization devices for the operation when work zone cameras are utilized.
2. "WORK ZONE CAMERA" sign shall be placed approximately half way between the 1st and 2nd advance warning signs. The larger sign size (48" x 48") shall be used on multi-lane highways.
3. The "WORK ZONE CAMERA" is not a substitute for any advance warning sign or device AND shall be used in addition to the required advance warning signs and devices.
4. Cameras shall be placed in a location to provide optimal field of view of traffic activity within the work zone. Cameras shall NOT be placed where they pose a hazard or conflict with the safe operation of the vehicle or equipment. A cone or drum may be placed near the tripod, camera mount and advance warning signs to increase visibility / conspicuity.

Warning Flags Required

= Camera Location

= Camera View

Work Area

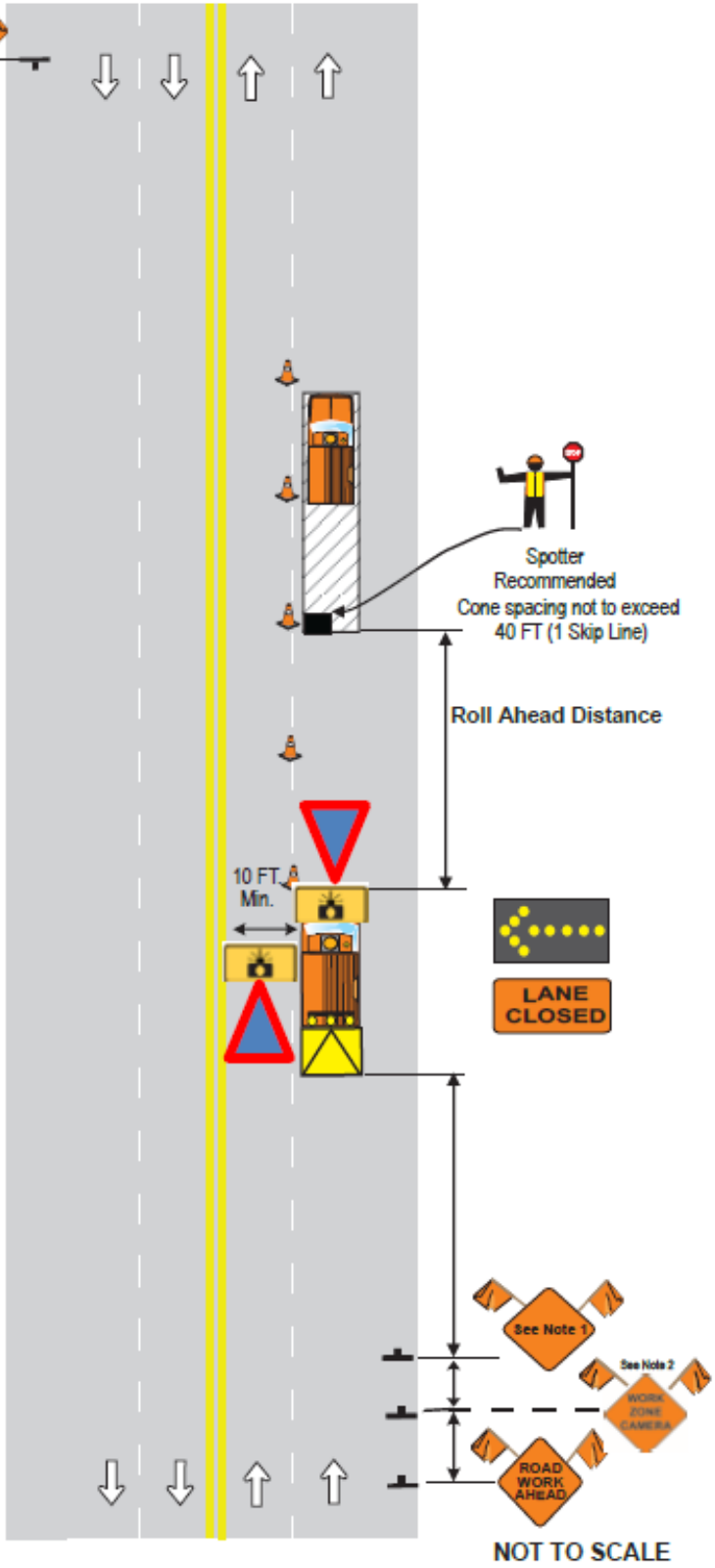
Arrow Panel

Barrier Vehicle with TMIA

Work Vehicle

NYSDOT OFFICE OF TRANSPORTATION MAINTENANCE SUPPLEMENTAL GUIDANCE FOR GENERAL, MOBILE, SHORT DURATION & SHORT TERM STATIONARY DAYTIME OPERATION INVOLVING SHOULDER OR LANE CLOSURE & WORK ZONE CAMERAS ON RURAL OR URBAN TWO OR FOUR LANE CONVENTIONAL HIGHWAY

FEBRUARY 2020



ITEM 619.10040020 - PORTABLE WORK ZONE CAMERA

TMI 20-01 PILOT WORK ZONE CAMERA POLICY - ADDENDUM 1

Notes:

1. This supplemental guidance shall be used in conjunction with the requirements of the applicable Temporary Traffic Control Plan, including advance warning signs, protective vehicles and channelization devices when work zone cameras are utilized.
2. Work Zone Camera may be used with Automatic Flagging Assistance Devices (AFADs). This supplemental guidance shall be used in conjunction with the applicable Temporary Traffic Control Plan when work zone cameras are utilized.
3. The "WORK ZONE CAMERA" sign shall be placed between the 2nd and 3rd advance warning signs using the spacing as indicated below. The "WORK ZONE CAMERA" is not a substitute for any advance warning sign or device AND shall be used in addition to the required advance warning signs and devices. The larger sign size (48" x 48") shall be used on multi-lane highways.
4. Cameras shall be placed in a location to provide optimal field of view of traffic activity within the work zone. Cameras shall NOT be placed where they pose a hazard or conflict with the safe operation of the vehicle or equipment.
5. When necessary, a cone or drum may be placed near the tripod or camera mount and advance warning signs to increase visibility / conspicuity.

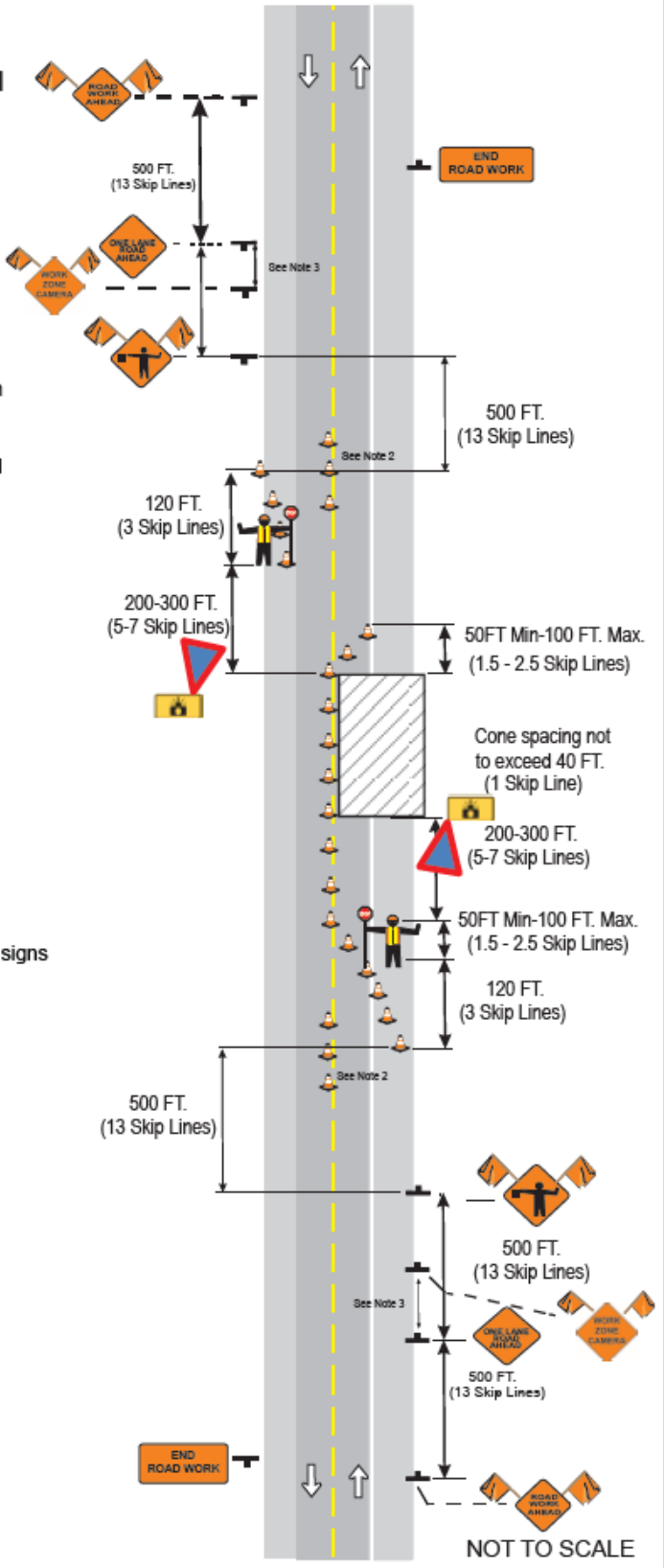
Warning Flags Required

Spacing:

Place half way between 2nd & 3rd advance warning signs

= Camera Location

= Camera View



NYSDOT OFFICE OF TRANSPORTATION MAINTENANCE
SUPPLEMENTAL GUIDANCE FOR
DAYTIME
SHORT-TERM STATIONARY OPERATION INVOLVING
LANE CLOSURE, FLAGGERS & WORK ZONE CAMERAS
RURAL
TWO-LANE CONVENTIONAL HIGHWAY
FEBRUARY 2020

ITEM 619.22970011 - TRAFFIC ENFORCEMENT AGENTS

DESCRIPTION

Under the item, professionally trained Traffic Enforcement Agents (TEAs) from the Police Department shall be provided in order to properly maintain the flow of traffic in the vicinity of the construction site, as specified in the contract documents and as determined and ordered by the Engineer. A boiler plate of formal agreement, as developed during the design phase of the project in consultation with the NYPD shall be executed by the Contractor as a final agreement with the Traffic Control Division/Office of Construction Mitigation and Coordination-Streets (OCMC) following the award of the contract, as provided in the special provisions.

MATERIALS

The contractor shall arrange for TEAs to be provided by the NYPD with a uniform readily identifiable to the traveling public. Each TEA will be equipped with all items, to be provided by NYPD, necessary to carry out their assigned duties.

CONSTRUCTION DETAILS

The TEAs will be deployed to provide adequate traffic control throughout the construction site . The location, hours and days to be worked by the TEAs shall be according to contract plans or as evaluated and determined by the Engineer in Charge before the start of the contract.

METHOD OF MEASUREMENT

The dollars-cents sum shown in the bid proposal for this item shall be considered the price bid including equipment & uniform cost although actual payment will be based on the work performed. The dollars-cents sum is not to be altered in any manner.

It is agreed that all work shall be based on the actual number of hours that each TEA performs at a post in addition to travel time. Travel time will not exceed two hours per day. For every four TEAs on duty there shall be one relief TEA. Relief TEAs are required to provide coverage for regularly posted TEAs during their staggered lunch or dinner period and breaks. They shall be paid for actual relief hours at the same rate as the agents they are relieving that day. Total estimated costs shall include the actual cost of fringe/leave benefits for each TEA and Supervisor.

The hours of supervisory personnel will be based on a percentage basis of man-hours worked by TEAs including travel time. Supervision will consist of level I, level II, and level III supervisors. Payment will be made based on work as follows: level I at 12.5%, level II at 2.5%, and level III at 1.33% of all hours worked by TEAs. Supervisory personnel hours are not subject to audit.

The hourly rate paid shall be the actual yearly salary, divided by the normal hours paid, including leave and holiday hours for TEAs. Those TEAs working overtime, including

weekends and holidays will be paid one and a half times their regularly hourly rate. Those TEAs starting work prior to 8:00AM and/or working beyond 6:00PM shall be entitled to a 10% night shift differential. An additional 5% of the total hours (TEA man hours worked including travel time and supervision hours) will be allowed for bookkeeping services in processing TEA time sheets.

BASIS OF PAYMENT

The contract price for this item shall be a dollars-cents price for the work performed under this item and shall be equal to the sum total of all vouchers submitted to the Contractor by the New York City Police Department (NYPD), as approved by the Engineer, for payment by the Contractor for the cost incurred in providing Traffic Enforcement Agents. Each TEA will be required on a daily basis to sign a time sheet showing date, time and the hours worked at each assigned location. These time sheets along with the report which shall contain the name of the agent, badge number and in-out will be submitted to the Engineer, on a daily basis, for verification. Payment under this item, will not be made until the Contractor has furnished satisfactory evidence (check etc.) to the Engineer that he has reimbursed the Police Department for said costs in providing Traffic Enforcement Agents.

The total estimated cost of this item is the “dollars-cents” amount shown for this item in the Bid Schedule. No guarantee is given that the actual dollars-cents cost for this item will in fact be the “dollars-cents” amount. The “dollars-cents” amount is included in the total bid solely to insure that sufficient monies will be available to pay the Contractor for these services.

The Contractor shall maintain separate books of accounts and shall not charge any portion of the cost of Traffic Enforcement services to another part of the work.

The voucher for the payment shall be submitted to the Engineer for approval on a monthly basis and shall include the signed copies of the daily summary time sheet.

Payment for this item shall be on a monthly basis upon submission of voucher to be verified by the Engineer. Payment to NYPD shall be prompt & should be treated separately from the payment made to subcontractors.

The “dollars-cents” is for bidding purposes only and shall not be varied in the bid. The contractor will be paid for the actual amount paid to NYPD and a 5% overhead as an administrative fee regardless of the dollars-cents, which may be more or less than the dollars-cents amount.

ITEM 634.90030011- RODENT AND VERMIN CONTROL - INITIAL SURVEY. BAITING AND SANITATION

ITEM 634.90040011 - RODENT AND VERMIN CONTROL - MAINTENANCE PROGRAM

DESCRIPTION

A. Under these items the Contractor shall perform and satisfy the rodent and vermin control (extermination) and site sanitation requirements within construction areas as designated by the engineer.

B. The contractor shall maintain a cooperative dialogue with appropriate agencies and management representatives of neighborhood properties.

C. The contractor shall perform the rodent and vermin control tasks described herein and also respond to other pest control needs when directed by the Engineer.

MATERIALS

1. Products

   A. Furnish and use only pesticide formulations registered by the U.S Environmental Protection Agency (EPA) and New York State Department of Environmental Conservation (DEC) where appropriate, according to label directions and as acceptable to the Engineer.

   B. Furnish and use devices and supplies (e.g., traps and bait stations) to facilitate the effectiveness and safety of the pest control program as appropriate and as acceptable to the Engineer.

2 Containers

   A. Use heavy duty refuse containers with tight-fitting domed lids, with a spring loaded flap, for disposal of all garbage and trash associated with food. Maintain these containers so there are no opening that allow access by rodents or vermin.

   B. If a dumpster is necessary for the temporary storage of garbage and trash associated with food, it shall not have openings that allow access by rodents or vermin. The dumpster shall have a drain plug if a drain is present, and the doors shall be maintained tightly closed.

CONSTRUCTION DETAILS

This work is to be performed prior to the start of construction and also throughout construction, so that Rodents (rats and mice) and Vermin (cockroaches, beetles, and other insects) do not disperse from or infest construction area or adjacent residential areas.

1. Submittals

ITEM 634.90030011- RODENT AND VERMIN CONTROL - INITIAL SURVEY. BAITING AND SANITATION

ITEM 634.90040011 - RODENT AND VERMIN CONTROL - MAINTENANCE PROGRAM

A. Submit to the Engineer copies of pesticide applicators certification and licenses within ten (10) days of their issuance or renewal for the duration of this Contract

B. After performing the survey described under Construction Details Section 6 and before initiating baiting, submit to the Engineer a written description of proposed pest control procedures, indicating materials, quantities, methods, and time schedule. For all pesticide be used, submit a copy of pesticide manufacture's EPA - approved pesticide label with application directions.

C. Submits to the Engineer documentation of pest control activities and results as follows:

1. Monthly - Submits data sheets with location of sites treated, methods and data application, amounts and types of bait used, pesticides dosage, number and types of traps set, survey and inspection results, sanitation condition complaints calls investigated, any problems that occurred and signature of applicator.

2. Monthly — submit a map that shows bait station, manholes and catch basins where baits are being maintained.

D. At least 10 days prior to occupancy of Contract area, submit to the Engineer for review a written description of the sanitation procedures to be used.

2. Qualifications:

A. The Contractor shall perform this work at all times in accordance with the following minimum standards and as acceptable to the Engineer.

B. The Contractor, key personnel and applicator shall have experience and/or training in vertebrate pest management and integrated pest management; have experience with various rodent and vermin control techniques, equipment, and strategies; and have knowledge of and experience with techniques to reduce non-targets hazards.

C. Applicators shall be licensed and certified by New York State DEC.

3. Coordination:

A. The contractor shall not proceed with the construction designated on the Plans until written release is issued by the Engineers, after successful completion of the initial phase of rodent and vermin control.

B. Initiate the work before field mobilization begins for the construction designated on the Plans and within adequate timing to achieve control before

environmental disruption and site work. Provide a maintenance program until construction is completed and all equipment and materials are removed, as determined by the Engineer.

C. Perform this work in such a manner and post warning signs such that toxicants or other control tools do not pose hazards to persons, domestic animals, or non-targets wildlife.

4. Permits:

A. Obtain and maintain in coordination with the Engineer appropriates permit(s) from city or state agencies for pest control activities associated with this work.

B. Obtain and maintain in coordination with the Engineer all right of entry permits required for the performance of this work. This includes all utilities and private properties to which entrance is requited.

5. Meetings:

A. Before proceeding with the work, all pest control personnel shall attend a two hour orientation session held by the Engineer and discuss planned pest control methods and coordination.

6. Survey:

A. Prior to baiting, survey the proposed construction area with representatives of adjacent buildings and record signs of rodent and vermin activity and sanitation conditions. Maintain survey in the manner described under Construction Details Section 10.

B. Thoroughly inspect construction areas and accessible or observable bordering area designated herein, and any nearby area designated by the Engineers, for rodent and vermin activity and sanitation deficiencies monthly throughout the duration of this contract and in accordance with the work schedule. Maintain inspection records in the manner described under Construction Details Section 10.

7. Application for Rodent and Vermin Control:

A. Apply rodenticide and insecticide in strict accordance with EPA-approved label directions and NYSDEC and NYCDEP regulations. Maintain records of all bait placements in the manner described under Construction Details Section 10.

B. Where appropriate, use properly secured and tamper-resistant bait stations consistent with EPA regulations, Remove manhole covers and ventilate manholes according to requirements of appropriate municipal agencies and

utility companies. Use a police, or utilities details as appropriates. Coordinate the work with appropriate municipal agencies and utility companies. Individually number and property identify all bait stations.

C. Baited area must be posted with warning signs advising the public that bait has been placed in the area. The signs are to be large (18 inches X 22 inches) and clearly printed at all baits stations.

D. Surface Applications

1. Initial Surface Bating

Rid the construction area of all detectable rodents and vermin before construction begins, as acceptable to the Engineer. Bait all observable rodent burrows and areas of vermin infestation. Install and secure bait stations at regular and appropriate intervals and locations, and document rodent or vermin activity (burrows, dropping, bait consumed, dead rodents). Replenish bait and shift stations as necessary to ensure complete control of rodent and vermin populations. Bait edge and accessible bordering areas designated on the Plans as necessary to ensure that rodents and vermin shall not infest work areas.

2. Maintenance Surface Baiting

Establish a maintenance baiting program prior to the start of construction. This includes construction areas and accessible bordering areas designated herein, as acceptable to the Engineer. Check bait placements weekly. Use survey and baiting data to determine the most effective distribution of baiting locations and bait quantities. Shift and distribute bait and bait stations as appropriates to ensure continuous control.

E. Subsurface Applications

1. Initial Subsurface baiting

Apply appropriate baits to control rodent and vermin populations in manholes and catch basins, This shall involve suspending and securing bait using noncorrosive wire (e.g., 24 gauge plastic coated). Place bait in all accessible manholes and catch basins within the construction work area. In addition, bait an appropriate set of manholes and catch basins in the blocks bordering the work area as designated herein and as acceptable to the Engineer. Identify all baited manholes and catch basins with a standardized paint mark on the street and, a numbered tag to be

attached to the suspending wire. Approximately seven days after completion of the first baiting, check all manhole and catch basin baits and record estimates on the amount of bait consumed. Replenish or increase the amount of bait applied according to the amount consumed and as acceptable to the Engineer. Repeat this process again approximately fourteen days later and until there is little or no bait consumed. Check manholes and catch basins weekly when they repeatedly have 100 percent of the bait consumed.

2. Maintenance Subsurface Baiting

Prior to the start the construction, establish a maintenance baiting program appropriate for the rodent or vermin infestation patterns identified during initial program appropriate for the rodent or vermin infestation patterns identified during initial subsurface baiting. This program shall ensure continued control and shall be performed acceptable to the Engineer. Maintain bait in manholes and catch basins that have rodent or vermin activity and those that had activity during initial baiting as necessary. Check each bait weekly or more often according to rodent or vermin activity levels and the recent history of bait consumption. Use utility maps and baiting data to determine the most effective distribution of baiting locations and bait quantities. Shift and distribute bailing locations as necessary to ensure adequate interception option points for controlling immigrating rodents or vermin.

F. Cleanup

1. Remove visible rodent carcasses and dispose of them daily consistent with the pesticide label directions and applicable codes, laws, and regulations.

2. Upon completion of any pest control operations at the site, remove remaining bait and dispose of it according to the pesticide label and applicable codes, laws, and regulations. Also remove all wires used for subsurface baiting and any bait stations or traps.

8. Sanitation:

Prior to construction and throughout the duration of this Contract, identify and document harborage and food sources available to rodents on the construction site and in observable bordering areas designated herein. This includes any littering or improper or insufficient use of trash receptacles in construction or structural deficiencies that violate City or State sanitation codes.

ITEM 634.90030011- RODENT AND VERMIN CONTROL - INITIAL SURVEY. BAITING AND SANITATION

ITEM 634.90040011 - RODENT AND VERMIN CONTROL - MAINTENANCE PROGRAM

Maintain records of sanitation conditions in the manner described under Construction Details Section 10.

A. Maintain Construction and laydown areas and their perimeters free of trash, garbage, weeds, debris and unnecessary or deteriorated hay and straw bales. Provide and enforce proper use of refuse containers to ensure that rodents and other pests are not harbored or attracted.

B. Designate specific locations as lunch and coffee break areas to prevent random disposal of garbage and trash. Keep those areas free of litter and garbage, and provide refuse containers. Keep refuse containers upright with their lids shut tight.

C. Have all refuse containers (described in Materials Section 2), emptied daily to maintain site sanitation. If a dumpster is used (as described in Materials Section 2) empty it at least weekly and keep the area under and around it clean.

D. Notify the Engineer within 24 hours whenever rodents (rats or mice) or signs of rodent activity (burrows or droppings) or vermin are observed in construction or laydown areas.

9. Complaint Calls

A. During construction, respond to pest-related complaints from the adjacent neighborhood within 12 hours when directed by Engineer. Inspect the particular premises and adjacent areas for sanitation and structural deficiencies and also signs of historic and recent pest activity. Provide sanitation and structural maintenance information to the property owner or manager. Use pesticides or traps as necessary and appropriate to resolve the complaint when there is a relationship between the pest infestation and construction activities, or when directed by the Engineer.

B. Maintain records of all complaints investigated, including location, contact person, inspection results, and actions taken. Document the relatedness of the pest infestation to construction activities.

10. Record Keeping

A. Use standard data sheets provided or approved by the Engineer to maintain accurate records of date, placement, type, and amount of pesticides or other control tools (e.g.. traps) applied. Similarly, maintain records of surveys, inspection, changes in pest activity, sanitation conditions, or when directed by the Engineer.

ITEM 634.90030011- RODENT AND VERMIN CONTROL - INITIAL SURVEY. BAITING AND SANITATION

ITEM 634.90040011 - RODENT AND VERMIN CONTROL - MAINTENANCE PROGRAM

METHOD OF MEASUREMENT

The quantity to be paid for under the item Initial Survey, Baiting and Sanitation, Will be on a lump sum basis for the initial work completed in accordance with the plans, specifications and direction of the Engineer.

The quantity to be paid for under the item, Maintenance Program, will be on a per month basis for the maintenance program completed in accordance with the plans, specifications and direction of the Engineer.

Extermination work to be performed under Item 202.0lnnnn - Disposal of Buildings will be measured and paid for under Item 202.01nnnn - Disposal of Buildings.

BASIS OF PAYMENT

The lump sum price bid for the item, Initial Survey, Baiting and Sanitation, shall cover the cost of all labor, material and equipment necessary to complete the initial survey, planning, documentation, baiting and inspection of the construction and adjacent areas both surface and subsurface as well as sanitation inspection, documentation and corrective measures.

The unit price bid per month for the item, Maintenance Program, shall cover the cost of all labor, materials and equipment necessary to complete the weekly inspections, rebaiting, cleanup and rodent and vermin control documentation, garbage disposal cleanup and sanitation documentation as well as to receive, document and respond to complaints.

ITEM 634.99010017 – BUILDING CONDITION SURVEY
ITEM 634.99020017 – VIBRATION MONITORING (NONBLASTING)

DESCRIPTION

A. Building Condition Survey. This work shall consist of performing a building condition survey(s) and preparing permanent records as indicated in the contract documents prior to the commencement of work, after completion of work, and at locations and times during construction as directed by the Engineer.

B. Vibration Monitoring (Nonblasting). This work shall consist of performing vibration monitoring of background and construction activities and preparing daily and summary report(s) of vibration readings.

MATERIALS

A. Building Condition Survey. Provide general photography and video equipment, analog or digital, capable of superimposing the date and time on all images.

B. Vibration Monitoring (Nonblasting). Provide a 3-component seismograph, capable of measuring particle velocity data in three mutually perpendicular directions. Annual factory calibration is required throughout the duration of the work.

CONSTRUCTION DETAILS

A. General. The Contractor shall engage the services of a firm capable of furnishing a New York State licensed Professional Engineer to conduct a condition survey of the existing building(s) indicated in the contract documents in the Special Note entitled Vibration Criteria and an experienced vibration monitoring Consultant to measure peak particle velocities prior to, and during, construction operations. Submit as proof to the Deputy Chief Engineer Technical Services (DCETS) the experience and qualifications of the firm's personnel conducting the work.

B. Building Condition Survey. Provide, as a minimum, the following information:

1. Photographic and videotape documentation of the interior and exterior condition of the building(s).

2. Extent and location of existing signs of building distress such as cracks, spalling, signs of settlement, flooding, leaking, etc.

The Engineer may accompany the Contractor on each building condition survey for verification of the data recorded. Provide two copies of all documentation of each building condition survey to the Engineer.

C. Vibration Monitoring (Nonblasting). The DCETS may waive the requirements of vibration monitoring based on the results of the building condition survey.

Perform continuous vibration monitoring during construction operations when adjacent construction activities make monitoring prudent. The Contractor shall perform contract work in

a manner that will limit construction vibration at the specified locations to within the limits set within the contract documents.

1. Submittal of Written Vibration Monitoring Plan. Prior to performing work adjacent to specified locations, a written Vibration Monitoring Plan prepared by the Contractor shall be submitted to the Engineer a minimum of 10 work days in advance for approval. The Engineer will send a copy of the Vibration Monitoring Plan to the Geotechnical Engineering Bureau, Engineering Geology Section, for review and written comment. The vibration monitoring plan may be returned to the Contractor for revision or clarification.

The vibration monitoring plan shall include the necessary information to outline the recording collection. The vibration monitoring plan shall include, but not be limited to, the following items:

a. Contract Designations

- The name of vibration monitoring specialist(s).
- The scheduled start date and length of construction operations which require vibration monitoring.
- The limits of vibration monitoring work, including sites on or off State-owned right-of-way.
- The location of all structures to be monitored in proximity to the construction operation.
- The location of any underground utilities in proximity to the construction operation.

b. Experience and Equipment

- Submit proof and details, as references, of two projects in the past five years where the vibration monitoring consultant performing the work has satisfactorily monitored construction operations by recording maximum peak particle velocities (PPVs). Include contact information for each reference.
- Submit information on the required 3-component seismograph, capable of measuring particle velocity data in three mutually perpendicular directions, including: the manufacturer's name, model number, and documentation of factory calibration performed within the last 12 months.

c. Methods and Procedures

- The location of adjacent structures to be monitored and maximum allowable PPVs as indicated in the contract documents. If not otherwise specified, a maximum allowable PPV in accordance with the United States Bureau of Mines (USBM) Vibration Criteria (Figure 1) shall be observed at all structures.
- The location of seismograph(s) placements, as directed by the Contractor's Professional Engineer. Recording seismographs may be installed on selected structures.
- Appropriate details for anchoring the geophone(s).

- The procedure for tracking PPV throughout construction operations (e.g., Pile Driving Operations: pile tip vs. vibrations may be correlated through time of day. A record of the time of day at each depth interval, included on the pile driving records, would be required to correlate to a time-based readout of PPV).

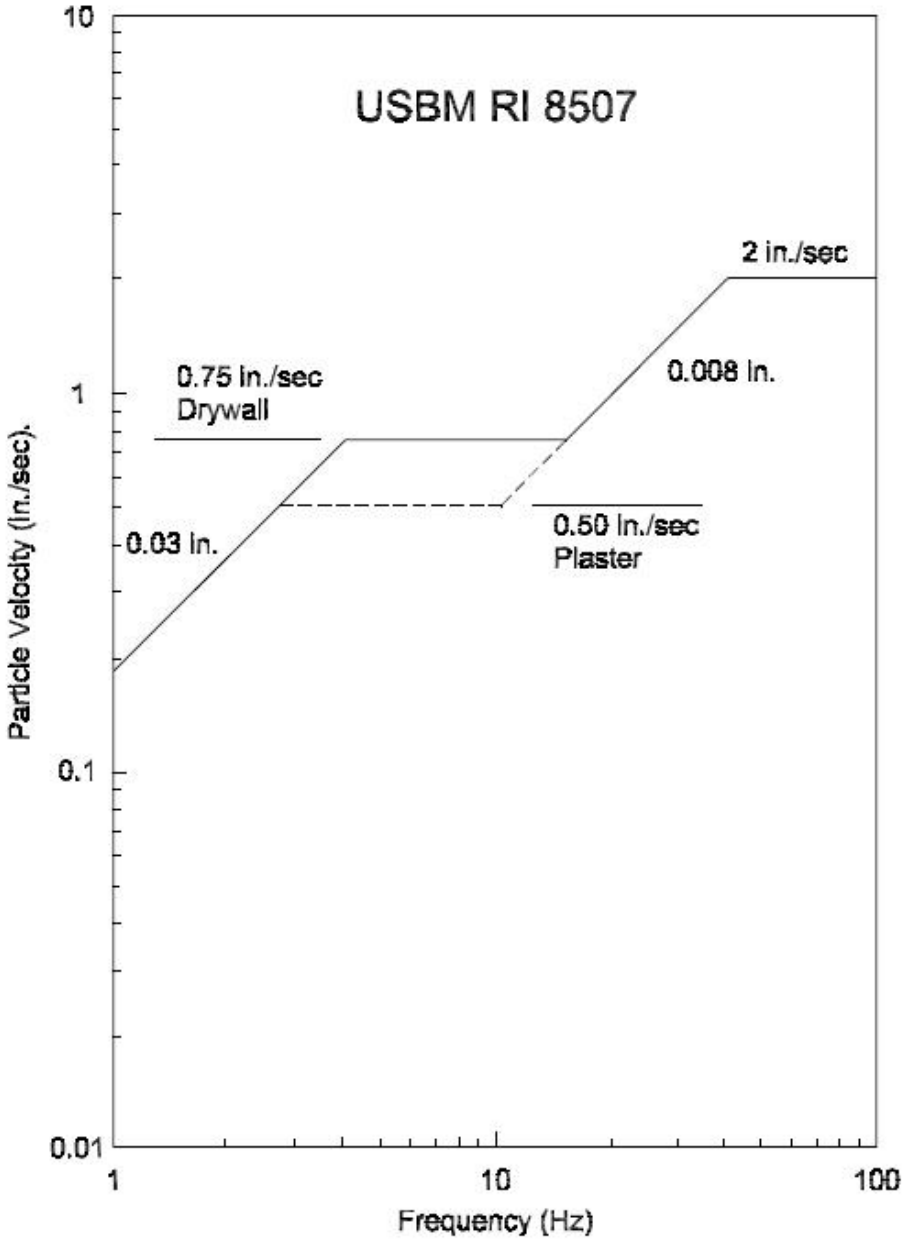


Figure 1—Safe Vibration Limit Recommendations for Residential Structures

Figure 1 – USBM Vibration Criteria (after Siskind et al, 1980)
The figure provides a "threshold damage" limit, defined as cosmetic damage (e.g., cracking) within the structure, categorized by both frequency ranges and particle velocity

2. Measuring Vibrations. The Contractor shall inform the Engineer immediately each time measured particle velocities exceed 85% of the allowable peak particle velocity. The Contractor shall make equipment or procedural modifications as required to avoid exceeding the allowable vibration intensity.

If the measured velocities exceed the maximum allowable PPVs, the Contractor shall stop operations immediately and revise equipment and procedures to reduce vibrations to allowable levels.

The Contractor shall be in communication with his monitoring firm's personnel during vibration monitoring at all locations to verify the data recorded.

The Contractor shall provide the Engineer with the results of daily vibration monitoring, one work day after the readings are taken. Upon completion of the construction operations for those locations requiring vibration monitoring, the daily submittals shall be synthesized into a final report.

If the seismographs show any indication of damage or vandalism, the seismographs shall be immediately recalibrated or replaced.

METHOD OF MEASUREMENT

A. Building Condition Survey. This work will be measured on a lump sum basis.

B. Vibration Monitoring (Nonblasting). This work will be measured on a lump sum basis.

BASIS OF PAYMENT

The unit price bid for building condition survey(s) and vibration monitoring shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work.

Vibration Monitoring (Nonblasting). Progress payments will be made for this item paid proportionally in accordance with the amount of work completed, measured on a workday basis.

Payment will be made under:

Item No.	Item	Pay Unit
634.99010017	Building Condition Survey	Lump Sum
634.99020017	Vibration Monitoring (Nonblasting)	Lump Sum

ITEM 637.31XX0020 – INSPECTION VEHICLES (MAXIMUM BID)

DESCRIPTION

This work shall consist of providing and maintaining motor vehicle(s) for exclusive use by the Engineer and the Inspection Staff.

MATERIALS

The vehicles(s) provided shall not be over 4 years old or have over 50,000 miles on the odometer as of the delivery date. The vehicle(s) shall be properly registered and be provided with an owner's policy of liability insurance in conformance with §107-06B. *Insurance Requirements*. The vehicles shall be in safe and serviceable operating condition with automatic transmissions and air conditioning.

A. Compact Sedan. The Contractor shall provide a Ford Focus or similar compact sedan.

B. Midsize/Intermediate SUV. The Contractor shall provide a Jeep Patriot or similar midsize/intermediate SUV. The SUV shall have all-wheel, or 4-wheel drive capability.

C. Small/Standard Pickup Truck. The Contractor shall provide a Chevrolet Colorado or similar small/standard pickup truck. The pickup truck shall have 4-wheel drive capability.

CONSTRUCTION DETAILS

Prior to the start of any contract work, the Contractor shall make the inspection vehicle(s) available for inspection by the Engineer. The Contractor shall make arrangements for delivery to the site on a date agreed to by the Engineer. If more than one vehicle is required, the number required will be shown in a Special Note entitled *Contractor Supplied Inspection Vehicles.*

Inspection vehicles will be operated by Department and consultant inspection staff possessing a valid driver's license as authorized by the Engineer and for official State business purposes only. The vehicle operator is personally liable for any traffic infractions, including parking tickets, or EZ Pass violations.

The Contractor shall provide all proper and scheduled maintenance (oil changes, tires) to keep the vehicle(s) in safe and serviceable operating condition and undertake all repairs as required, including repairs arising from vandalism, accidents or other damages. If a vehicle becomes unavailable for any reason or requires maintenance or repairs which cannot be completed on the same day, a comparable replacement vehicle shall be provided while the vehicle is out of service. The Department will provide fuel and EZ Pass for the vehicle(s).

METHOD OF MEASUREMENT

Each inspection vehicle will be measured for payment on a monthly basis, measured to the nearest 0.25 months.

BASIS OF PAYMENT

The unit price bid per month shall include all costs in connection with furnishing properly registered vehicle(s), maintaining and repairing the vehicles as required and providing an owner's policy of liability insurance for the vehicles in conformance with §107-06B. *Insurance Requirements.* A deduction of 1/30 of a month will be made for each 24-hour period, or portion thereof, during which the vehicle is unavailable to the Engineer, regardless of the reason for the vehicle's unavailability. Payment may be terminated on a specified date prior to contract final acceptance by written notification from the Engineer that a vehicle will no longer be required.

ITEM 637.31XX0020 – INSPECTION VEHICLES (MAXIMUM BID)

Payment will be made under:

Item	Description	Unit
637.31010020	Inspection Vehicles, Compact Sedan	Month
637.31020020	Inspection Vehicles, Midsize/Intermediate SUV	Month
637.31030020	Inspection Vehicles, Small/Standard Pickup Truck	Month

MAXIMUM BID ITEM

The maximum bid allowed per vehicle(s) per month shall be that shown in the proposal. The Contractor may bid less than the maximum bid, but any bid exceeding the maximum bid will be disregarded and changed to the amount shown in the proposal.

ITEM 637.4000nn20 - WEBCAM SYSTEM

DESCRIPTION

This work shall consist of providing, installing, maintaining and removing a webcam system, with a camera mounted on wood utility pole. A single website for image storage and online access may be used for multiple cameras, provided the images are organized and available for each camera separately.

MATERIALS

The webcam system shall meet the following material requirements:

Camera

- The high definition camera and lens assembly shall take high resolution (minimum 16 megapixel - 4928 x 3264) digital still color images and have digital pan, tilt, and zoom capabilities
- Imager: 23.6 X 15.6 CMOS.
- Auto Features: Focus, Shutter, ISO, and white balance.
- Powered by 120 VAC electrical supply, GFCI protected (provided, installed, maintained and removed by Contractor).

Camera Enclosure

- The camera enclosure shall be UL compliant and shall meet NEMA Type 3R standards.
- Include provisions for a fixed installation to a pole or wall.
- Shall include a thermal insulation package, heater, blower, window defroster kit, sun shroud and shall operate within a minimum temperature range of -10°F to 110°F.
- Powered by 120 VAC electrical supply, GFCI protected (provided, installed, maintained and removed by Contractor).

Interface and Online Access

- The system must provide wireless cellular modem as an option for uploading the digital still images.
- The online interface system shall allow viewing of all high-definition digital still images captured and stored during the duration of the contract over the internet with password-protection.
- The still images shall be in a non-proprietary format that can be freely viewed with most image viewing software (.bmp, .jpeg, .tif or .gif)
- Navigation: Calendar based navigation system for selecting specific images on specific days.
- Capable of viewing actual live video.
- HD Snapshot on Demand: HDR (High Dynamic Range) Imaging and Additional Special Effects Including Architectural Miniature, Artistic Color Sketch and Cinematic Black & White
- Graphical mark-up tools for detailing and creating overlays on images.
- Graphical weather applet displaying ten points of local weather data and 48-hour forecast.
- Remote cellular monitoring screen displaying connectivity, network traffic and modem temperature.
- Remote wireless radio monitoring screen displaying connectivity, network traffic and Google Map features including wireless radio locations.
- Image Comparison: Capability to choose and overlay images from two different dates in the same viewing window
- Zoom: Pan and zoom capability for zooming into the high definition images.
- Remote Solar Monitoring Screen Displaying the DC Amperage Output of Solar Panels.
- Fullscreen: Screen maximizing the view of the images on the users monitor.
- Slideshow: Capability to browse through images, moving forward and backward in time by individual image and by day.
- Picture in Picture to view live video, while viewing high definition images.

- All Images are the Copyright of the Department and Protected on Secure Servers Owned and Operated by the System Vendor.

Embedded Wood Utility Pole

- The pole shall me a minimum 60 feet in length, Southern pine and meet the requirements of ANSI #05.01 for Class 4 utility type poles.
- The pole shall be given a water borne preservative treatment in accordance with §708-31.

CONSTRUCTION DETAILS

The Contractor shall provide, install and maintain a fully functional webcam system including an electrical power supply, camera hardware, mounting pole and equipment, data connections, image storage, online interface for the system and technical support. The Contractor is required to have the webcam system's vendor made available for support services and equipment maintenance/repairs.

The Contractor shall provide, install, maintain and remove the webcam system. The Contractor shall coordinate with the Engineer to install the camera in an approved location and provide password access to the webcam system's Internet site. The camera shall be installed so that the position of the sun or any man-made light source does not point directly into the camera. The camera shall be tested at the site both prior to and subsequent to installation, including having the webcam system's vendor remotely confirm both successful tests. The Contractor shall clean the installed components in accordance with manufacturer's recommendations at least monthly, or as needed to ensure image clarity.

The pole shall be installed plumb, in a hole of sufficient depth to allow for a minimum of 10 feet embedment. The area around the pole shall be backfilled with suitable material and thoroughly compacted. The Contractor shall restore, in kind, all areas which were disturbed by the pole installation operation.

The webcam system shall consist of all-weather, tamper/impact resistant, fixed mounted camera enclosure with integrated, fixed high definition camera. The camera shall have the ability to take a high-resolution digital still color image of the construction site at a set time interval, as least every fifteen (15) minutes, and securely upload the still images to a secure, password-protected website. The image data shall at all times be the property of the State. The digital still images shall be stored on a remote server (with sufficient storage capacity to store all images taken on the contract) and be made available for viewing on the website in chronological order. The website shall provide the ability to zoom in on the images. Password access to the website shall be granted to those parties specified by the Engineer (Department staff and the Contractor, at a minimum). The Contractor shall provide the Department with an archive in DVD or external hard drive format of all the digital still images in a sortable/identifiable format. The still image file names shall include the date and time taken.

The Contractor shall maintain all equipment in working condition and shall provide replacement due to breakdown, damage, or theft within two (2) work days. The Contractor's webcam system vendor shall proactively monitor the webcam system and if no system connection is made within normal working hours, not to exceed 24 hours, the vendor shall notify the Contractor and begin troubleshooting.

The Contractor shall remove all webcam system equipment and wood utility pole within ten (10) work days after the Engineer requests the removal in writing. The webcam system equipment and pole shall remain the property of the Contractor. The State shall retain ownership of all data collected by the webcam system.

The webcam system shall be operated in accordance with the "Policy for the Operation of Webcam Systems on Construction Contracts", a copy of which will be provided to the Contractor by the Engineer.

ITEM 637.4000nn20 - WEBCAM SYSTEM

METHOD OF MEASUREMENT

The webcam system will be measured for payment on a monthly basis, measured to the nearest 0.25 months.

BASIS OF PAYMENT

The unit price bid per month for the webcam system shall include the cost of all labor, materials and equipment, including services to provide, install, maintain and remove all components of the webcam system and wood utility pole. A deduction of 1/30 of a month will be made for each 24-hour period, or portion thereof during which the webcam system is not operational. Payment will begin the first month the webcam system is installed, operational and made available for use, including having the website established and functional. Monthly payments will be terminated no later than two (2) weeks after written notification by the Engineer that the webcam system will no longer be required.

ITEM 655.00XX0011 - CAST FRAMES AND GRATES AND MANHOLE COVERS

DESCRIPTION

This work shall consist of furnishing and installing Cast Frames and Grates and Manhole Covers, in accordance with the contract documents and as directed by the Engineer.

MATERIALS

All the provisions of **§655-2.01 Castings** shall apply, and in addition, the requirements shown on the following drawings shall also apply:

REGION 11 DESIGN GUIDE SHEET, DRAINAGE DETAILS, FRAMES, GRATES & STEPS
REGION 11 DESIGN GUIDE SHEET, DRAINAGE DETAILS, FRAME WITH CURB BOX

N.Y.C. DEPARTMENT OF ENVIRONMENTAL PROTECTION, SEWER DESIGN STANDARDS,

- STANDARD FOR 27" DIAMETER CAST IRON FRAME AND MANHOLE COVER
- STANDARD FOR CAST IRON FRAME FOR CATCH BASINS (WITH CURB PIECE)
- STANDARD FOR CAST IRON GRATING, BACK PLATE, AND CURB PIECE FOR CATCH BASINS

N.Y.C. DEPARTMENT OF PARKS AND RECREATION, STANDARD DETAILS,

- DRAINAGE DETAILS – NO. 1
- PARKS LEAF MANHOLE AND CATCH BASIN COVERS

CONSTRUCTION DETAILS

All the provisions of **§655-3 CONSTRUCTION DETAILS** shall apply, and in addition, the requirements shown on the appropriate New York City drawings shall also apply.

METHOD OF MEASUREMENT

This work will be measured as the number of Cast Frames and Grates, or Cast Frames and Manhole Covers, satisfactorily furnished and installed.

BASIS OF PAYMENT

The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work, including the cost of any field repair work for improperly fitting castings, or to render the frame and grate non-rocking.

Payment will be made under:

Item No.	Item	Pay Unit
655.00010011	Cast Frame for Catch Basin (Region 11)	Each
655.00020011	Cast Frame and Curb Box for Catch Basin (Region 11)	Each
655.00030011	Cast Grate for Catch Basin (Region 11)	Each
655.00040011	Cast Grate for Catch Basin (NYCDEP)	Each
655.00050011	Cast Frame for Manhole (NYCDEP)	Each
655.00060011	Cast Cover for Manhole (NYCDEP)	Each
655.00070011	Rectangular Cast Frame for Catch Basin (NYCDPR)	Each
655.00080011	Cast Grate for Catch Basin(NYCDPR)	Each
655.00090011	Cast Grate for Catch Basin(NYCDPR, ADA)	Each
655.00100011	Round Cast Frame for Manhole or Catch basin (NYCDPR)	Each
655.00110011	Cast Cover for Manhole (NYCDPR)	Each

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4/2/2009

ITEM 680.17002211 – 22 FOOT CABINET POLE
ITEM 680.17003011 – 30 FOOT CAMERA POLE
ITEM 680.17004011 – 40 FOOT CAMERA POLE
ITEM 680.17006011 – 60 FOOT CAMERA POLE

DESCRIPTION

Under these items, the contractor shall furnish and install Poles at the locations specified on the plans and in accordance with these specifications or as directed by the Engineer.

MATERIALS

The materials and fabrication of the Pole shall meet the requirements of Subsection 724-03 Traffic Signal Poles of the New York State Standard Specifications except as noted.

The poles shall be fabricated in lengths and shall have design load as specified on the plans.

The anchor bolt cover shall be a two piece steel cover which encompasses the entire pole base and all anchor bolts and nuts. The anchor bolt cover shall be braced to prevent deformation from impact. It shall be secured to the pole base plate with a minimum of eight ¼ inch stainless steel bolts. The base plate shall be tapped to accept the ¼ inch bolts.

All couplings for electrical connections and the mounting plates for the controller cabinets shall be shop installed by welding. When specified on the plans, the bolt holes for a span wire through bolt shall be shop drilled. The Contractor is responsible for the proper alignment of the fittings and bolt holes with the anchor bolts installed in the foundation such that when the pole is mounted on the foundation, the couplings, control cabinet, and span through bolt are aligned in accordance with the plans and standard sheets.

The pole shaft, base plate, anchor bolt covers, pole cap, hand holes, hand hole covers, weatherheads, service bracket, conduits, and cabinet mounting brackets shall be Hot-Dip galvanized coated per ASTM A123 after fabrication.

A galvanized ¼ inch diameter cable support hook shall be furnished and installed as shown on the plans.

The mounting brackets for the CCTV camera pan/tilt drive and weatherproof enclosure shall be furnished and installed under other items (Applies to Camera Poles only).

CONSTRUCTION DETAILS

The Construction Details shall meet the requirements of sections 680-3.01, Equipment Lists and Drawings through 680-3.12, Grounding, of the Standard Specifications except as noted.

The poles and fittings shall be protected from damage in shipping to the field locations and during installation. The poles shall be wrapped with two layers of heavy paper.

ITEM 680.17002211 – 22 FOOT CABINET POLE
ITEM 680.17003011 – 30 FOOT CAMERA POLE
ITEM 680.17004011 – 40 FOOT CAMERA POLE
ITEM 680.17006011 – 60 FOOT CAMERA POLE

METHOD OF MEASUREMENT

This work will be measured by the number of Poles furnished and installed.

BASIS OF PAYMENT

The provisions of Section 680-5.01 shall apply. In addition the unit price bid for furnishing and installing Poles shall include the cost of all the items specified in Section 680-3.01 through 680-3.12 of the updated Standard Specifications (US Customary) and the necessary grounding system, anchor bolts, pole assembly, and erection. The cost of cabinets, camera assemblies with mounting equipment, and connecting cables will be paid for under other contract items.

ITEM 680.51960011 - FURNISH AND INSTALL CONCRETE FIBER OPTIC PULL BOX

DESCRIPTION

Under this item, a concrete fiber optic pull box shall be furnished and installed in accordance with this specification, the attached drawing and as shown on the plans.

MATERIALS

In addition to the requirements shown on the plans, the pull box, frame and cover shall be in accordance with the minimum requirements specified in sub-section 680-2.02 and .05 of the Standard Specifications.

The minimum internal dimensions of the pull box shall be 36 inches L X 36 inches W X 49 inches D.

The pull box, frame, and cover shall have sufficient mechanical strength to withstand the impact of repeated HS-25 vehicle live loads without damage.

The cover of the pull box should have “NYSDOT” embossed on it.

The contract may require additional embossing on the cover of the pull box as shown on the plans and as directed by the Engineer.

At least two (2) Penta bolts shall be used to lock the cover in place.

CONSTRUCTION DETAILS

The pull box shall be installed in accordance with the details shown on the plans.

Sub-sections 680-3.01,.04,.06,.09,.12,.13 and .14 of the Standard Specifications shall apply to the work of this item.

The pull box shall be constructed in conformance to this specification and as shown in the plans. Any holes for conduit and cable entry shall be carefully drilled or punched into the side of the pull box. After insertion of conduits or cables, holes shall be tightly and thoroughly sealed to the satisfaction of the engineer.

Soil in the vicinity of the pull box shall be vibrated and thoroughly compacted around the entire pull box up to grade.

The top of the cover shall be set at grade. A concrete lock-in feature shall be provided around the top of the pull box.

If indicated on the plans or directed by the engineer, the work shall include the installation of a fiber optic cable splice into the box. In addition, 33 feet of coiled fiber optic cable shall be looped in the box. However, the actual fiber optic splice and cable are paid for under other contract pay items.

ITEM 680.51960011 - FURNISH AND INSTALL CONCRETE FIBER OPTIC PULL BOX

METHOD OF MEASUREMENT

The item will be measured for payment as the number of each unit furnished and installed in accordance with the contract documents or as directed by the engineer.

BASIS OF PAYMENT

The unit price bid for the concrete fiber optic pull box shall include the cost of furnishing all equipment, materials, incidentals, labor, tools and documentation required to complete the work. All concrete, frames, covers, reinforcing steel, crushed stone or gravel, extensions, saw cutting, excavation, backfill and restoration of adjacent surfaces shall be included in the cost of this item.

ITEM 680.53000111 - S.S. NEMA-4X STRUCTURE MOUNTED PULL BOX (16″ X 12″ X 8″)
ITEM 680.53000211 - S.S. NEMA-4X STRUCTURE MOUNTED PULL BOX (36″ X 24″ X 8″)
ITEM 680.53000311 - S.S. NEMA-4X STRUCTURE MOUNTED PULL BOX (36″ X 36″ X 12″)
ITEM 680.53000411 - S.S. NEMA-4X STRUCTURE MOUNTED PULL BOX (48″ X 48″ X 12″)

DESCRIPTION

Under this item the Contractor shall furnish and install stainless steel junction boxes with lockable hinged covers on above ground structures for the purpose of providing conduit junction points, pull points and splice locations for fiber optic communications and electrical cables as shown on the plans or as directed by the Engineer.

MATERIALS

The pull boxes shall be suitable for use in an outdoor corrosive environment and shall meet the requirements for NEMA 4X and UL 508, and be of the nominal dimensions as per the item description.

Pull boxes shall be fabricated from 14 gauge type 316L stainless steel with seams continuously welded and ground smooth. All exterior surfaces shall have a smooth grained finish.

Pull boxes shall be provided with the following:

- Continuous hinged stainless steel door equipped with polyurethane seamless gasket.
- Stainless steel door clamps and hasp and staple for padlocking.
- External mounting feet.
- Bonding provision on door and grounding stud on body.

Each pull box shall be designed to support up to three conduit entrances, except as shown on the contract plans, including a termination plug and cable entry fitting.

36” x 36” x 12” and 48” x 48” x 12” pull boxes shall accommodate the fiber optic splice enclosure and be supplied with brackets to lock the fiber optic splice enclosure in place and to loop excess cable inside the box in accordance with minimum allowable bending radius for the fiber cable.

Pull box mounting hardware shall be stainless steel in accordance with Subsection 715-16.

Steel support brackets and hanger systems for mounting the pull boxes to bridge superstructure shall comply with Subsection 715-01. Minimum thickness of support members shall be in accordance with Subsection 8.5 of the NYSDOT Bridge Manual, as shown on the plans, or as directed by the Engineer.

Epoxy type anchors with stainless steel bolts shall be used for attachments to walls and other concrete structures. The epoxy adhesive shall be in accordance with Subsection 701-07.

ITEM 680.53000111 - S.S. NEMA-4X STRUCTURE MOUNTED PULL BOX (16″ X 12″ X 8″)

ITEM 680.53000211 - S.S. NEMA-4X STRUCTURE MOUNTED PULL BOX (36″ X 24″ X 8″)

ITEM 680.53000311 - S.S. NEMA-4X STRUCTURE MOUNTED PULL BOX (36″ X 36″ X 12″)

ITEM 680.53000411 - S.S. NEMA-4X STRUCTURE MOUNTED PULL BOX (48″ X 48″ X 12″)

CONSTRUCTION DETAILS

Surface mounted pull boxes shall be installed at the locations shown on the plans. For surface mounting, the boxes shall be securely bolted as detailed on the plans or as approved by the Engineer.

Drilling of holes for the anchor bolt assemblies to attach pull boxes to walls and other concrete structures shall be in accordance with Subsection 586.

Pull boxes may be embedded in concrete walls at locations where shown on the plans or if approved by the Engineer.

The galvanized steel conduits entering the pull boxes shall be bonded and grounded.

The pull boxes shall be completely installed prior to pulling any cable or installing any splice enclosures.

The Contractor shall prepare a shop drawing submittal which will include copies of descriptive literature for the various pull boxes and details for all brackets, supports, and mounting brackets to be provided.

METHOD OF MEASUREMENT

This work will be measured as the number of pull boxes of each size satisfactorily furnished and installed in accordance with the contract documents or as directed by the Engineer.

BASIS OF PAYMENT

The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work, including mounting brackets and supports, connecting hardware and anchor bolts. Fiber optic cable splice enclosures will be paid under their respective items.

ITEM 680.92124811 - SINGLE MODE FIBER OPTIC TRUNK CABLE 48 FIBER (IN CONDUIT)
ITEM 680.92127211 - SINGLE MODE FIBER OPTIC TRUNK CABLE 72 FIBER (IN CONDUIT)
ITEM 680.92124411 - SINGLE MODE FIBER OPTIC TRUNK CABLE 144 FIBER (IN CONDUIT)

DESCRIPTION:

Under this item, the contractor shall furnish and install fiber optic cable in conduit as designated in the plans or as directed by the engineer.

MATERIALS:

(a) Fiber Optic Cable

The fiber optic cable shall be a loose buffer-tube design, suitable for aerial, conduit, and direct-bury installation. The cable shall comply with Bellcore Standard TR-TSY-000843.

The fiber-optic cable shall consist of step-indexed, single-mode fibers, with a core/cladding diameter of 0.3/4.9 mil (8.3/125 um). The cable shall have certified operation at both the 1310 nm and 1550 nm wavelengths.

The characteristics of the cable shall comply with the following specifications:

Number of Fibers in Cable	= 48/72/144
Number of Fibers/Tube	= 12
Number of Buffer Tubes	= 4/6/12
Maximum Cable Diameter	= 0.80 in.
Minimum Bending Radius	= 15.75 in. (With Tensile Loading) 8 in. (Without Tensile Loading)
Minimum Tensile Strength	= 600 lbs During Installation 135 lbs In Service
Operating Temperature Range	= - 40 to 158 °F
Markings	= NYSDOT ITS TRUNK
Attenuation	= <0.40 db/km (1310 nm) <0.25 db/km (1550 nm)

The cable shall be constructed of the following layers from the outside to the inner or of a functionally equivalent design. If a different design is used, the contractor shall submit evidence detailing how the alternate design meets or exceeds the performance that would be obtained from the specified configuration. The engineer reserves the right to approve or reject any alternate proposal.

ITEM 680.92124811 - SINGLE MODE FIBER OPTIC TRUNK CABLE 48 FIBER (IN CONDUIT)
ITEM 680.92127211 - SINGLE MODE FIBER OPTIC TRUNK CABLE 72 FIBER (IN CONDUIT)
ITEM 680.92124411 - SINGLE MODE FIBER OPTIC TRUNK CABLE 144 FIBER (IN CONDUIT)

Layer 1(Outer)	- High Density Polyethylene sheath
Layer 2	- Treated glass yarns to provide strength and rodent protection
Layer 3	- Water Blocking Tape
Layer 4	- Gel-filled loose tubes or filler rods
Layer 5	- Central Strength Member constructed of a aramid or epoxy-glass composite rod

The outer cable jacket shall have sequential length markings in feet. The actual length of the cable shall be within +/- 1% of the length markings. The marking shall be in a contrasting color to the cable jacket. The height of the marking shall be approximately 0.1 in.

The Contractor shall provide a certificate of compliance verifying that the cable being proposed complies with the requirements set forth in this item. The certificate shall be provided as part of the shop drawings and shall include certified test results from an independent laboratory. All test documentation shall be provided in English. The test results submitted for approval shall not be more than two years old and shall have been conducted on similar materials to those being proposed for the project. The engineer reserves the right to order the contractor to perform specific tests on the samples of the cable to be provided, if it is determined that the certified test results provided are invalid or inadequately document that the cable complies with all of the requirements of these specifications.

Before shipment, but while on the shipping reel, the optical attenuation all fibers shall be measured and documented. Copies of the results shall be attached to the cable reel in a waterproof pouch, and submitted to the Engineer prior to the delivery of the cable to the job site. The attenuation tests shall be performed with an OTDR capable of recording and displaying anomalies of 0.2 dB as a minimum. The single-mode fibers shall be tested at both 1310 nm and 1550 nm.

The internal fibers and buffer tubes shall be color coded according to standard Bellcore requirements as outlined below:

Tube/Fiber #1 - Blue
Tube/Fiber #2 - Orange
Tube/Fiber #3 - Green
Tube/Fiber #4 - Brown
Tube/Fiber #5 - Slate
Tube/Fiber #6 - White
Tube/Fiber #7 - Red

ITEM 680.92124811 - SINGLE MODE FIBER OPTIC TRUNK CABLE 48 FIBER (IN CONDUIT)
ITEM 680.92127211 - SINGLE MODE FIBER OPTIC TRUNK CABLE 72 FIBER (IN CONDUIT)
ITEM 680.92124411 - SINGLE MODE FIBER OPTIC TRUNK CABLE 144 FIBER (IN CONDUIT)

Tube/Fiber #8 - Black
Tube/Fiber #9 - Yellow
Tube/Fiber #10 - Violet
Tube/Fiber #11 - Rose
Tube/Fiber #12 - Aqua

CONSTRUCTION DETAIL:

The Contractor shall prepare a shop-drawing submittal, which will include copies of descriptive literature for every component to be installed under this item. The submittal shall include a certificate of compliance verifying that the cable complies with the material requirements as detailed in the material section of this specification. The certificate of compliance shall be provided by an independent testing authority. If the engineer determines that the certificate of compliance is not acceptable, the contractor shall be required to perform factory testing on exact samples of cables being proposed for the project.

The Contractor shall prepare an installation plan, identifying how the cable reels will be set up and how the cable will be pulled and spliced. The plan shall be designed to minimize the number of fiber optic splices required. In addition, the need to close main-line expressway or arterial street lanes shall be minimized.

The contract includes fiber optic splices at designated points along the run. The number of splices indicated on the plans shall not be increased without the approval of the engineer. However, the contractor shall be able to propose alternate locations for the splices, based on the installation plan the contractor provides. Fifty (50) feet of slack cable shall be provided for each cable leg at each splice point or as indicated on the contract plans. This is equivalent to supplying one-hundred (100) feet of excess cable in each splice box during installation.

The Engineer shall approve the shop-drawing submittal prior to installing any of the material covered under this bid item at the project site.

Upon arrival at the job site and prior to installation, the Contractor shall inspect the cable and reel for signs of physical damage. The attenuation of all fibers shall be measured with a field OTDR for to confirm that the cable satisfies the specified requirements. Test results shall be recorded, dated, compared to the factory test results accompanying the shipping reel. Attenuation deviations from the shipping records greater than 5 percent shall be brought to the attention of the Engineer. The cable shall not be installed until completion of these test sequences and written approval from the

ITEM 680.92124811 - SINGLE MODE FIBER OPTIC TRUNK CABLE 48 FIBER (IN CONDUIT)
ITEM 680.92127211 - SINGLE MODE FIBER OPTIC TRUNK CABLE 72 FIBER (IN CONDUIT)
ITEM 680.92124411 - SINGLE MODE FIBER OPTIC TRUNK CABLE 144 FIBER (IN CONDUIT)

Engineer is obtained. Copies of traces and test results shall be submitted to the Engineer. If the OTDR test results are unsatisfactory, the reel of fiber optic cable shall be considered unacceptable and all records corresponding to that reel of cable shall be marked accordingly.

Prior to placing the cable, all preparatory work, including the installation of supports, conduits, pull boxes, trenching, and man-holes shall have been completed.

The methods used to install the cable shall not exceed the rated pulling-strength of the cable and shall be consistent with the manufacturer's published procedures. The fiber optic cable shall be installed in conduit as detailed in the plans or directed by the engineer.

After placing each segment of cable, and prior to splicing, the Contractor shall measure the attenuation of the fibers in the installed cable. The Contractor shall compare the results of this test with those of the previous test for the same cable and fibers. Any change in attenuation shall not exceed the tolerance of the original specifications. If any fibers fail the test, or if the length of fiber as measured by the OTDR has changed, the cable shall be removed from the job site and replaced with an entirely new cable, at the Contractor's expense.

METHOD OF MEASUREMENT:

This work will be measured for payment as the number of feet of fiber optic cable actually installed, as verified by the sequential length markings on the cable, in accordance with the Contract Documents and as directed by the Engineer.

BASIS OF PAYMENT:

The unit price bid per foot of fiber optic cable installed shall include the cost of all labor, materials, supports, testing, and equipment necessary to complete the work.

Lengths of cable shall be eligible for payment after the as-installed attenuation testing has been completed for a segment. Conduit shall be existing or paid for under a separate bid item as detailed in the plans.

Splices are paid for under a separate bid item. However, if more splices are needed by the contractor and then approved by the engineer, the additional splices shall be completed as an incidental cost of installing the cable as part of this bid item. If fewer splices are required, the contractor shall be paid for the actual number of splices completed.

ITEM 680.95010415 - SERVICE CABLE 1 CONDUCTOR, NO. 04 AWG
ITEM 680.95010615 - SERVICE CABLE 1 CONDUCTOR, NO. 06 AWG
ITEM 680.95010815 - SERVICE CABLE 1 CONDUCTOR, NO. 08 AWG
ITEM 680,95011015 - SERVICE CABLE 1 CONDUCTOR, NO. 10 AWG
ITEM 680.95020415 - SERVICE CABLE 2 CONDUCTOR, NO. 04 AWG
ITEM 680.95020615 - SERVICE CABLE 2 CONDUCTOR, NO. 06 AWG
ITEM 680.95020815 - SERVICE CABLE 2 CONDUCTOR, NO. 08 AWG
ITEM 680.95021015 - SERVICE CABLE 2 CONDUCTOR, NO. 10 AWG

Description. Under this item the Contractor shall furnish and install in a raceway or conduit service entrance cable which is suitable for wet or dry locations at the location indicated on the plans and as directed by the Engineer. This cable will transmit current from the power source to the signal controller cabinet.

Material. The cable shall conform to the requirements for service entrance cable of the National Electrical Code and be Underwriters Laboratory approved. The cable shall be rated for 600 volt service and the conductors shall be stranded copper wire or as specified in the contract documents.

Construction Details. Service cable shall be installed in accordance with Details: the contract documents and as directed by the Engineer. A sufficient length of cable, not less than 24 inches, shall be left at the end of the run to allow for the tap to be made by the utility company at the power source entrance. The Contractor shall make all connections at the fused disconnect and the ground bar in the signal controller cabinet.

Method of Measurement. Service cable will be measured as the number of linear feet actually installed in accordance with the contract documents or as directed by the engineer.

Basis Of Payment. The unit price bid per linear foot shall include the cost of all materials, labor, connections, incidental fittings, equipment, tools, and all necessary tests to complete the installation.

ITEM 680.95533211 - METER CABINET

DESCRIPTION:

This work shall consist of furnishing and installing a new meter cabinet at the locations indicated in the contract documents.

MATERIALS:

The meter cabinet shall consist of the components and incidentals necessary as required by the utility to provide a totally operational assembly with all cabling and terminations matched to support the selected components.

Cabinet

The cabinet shall be sized as indicated on the contract drawings and be manufactured of 5052-H32 aluminum with welds using the Heliarc method. The door opening shall be double flanged on all four sides. Hinges shall be heavy duty stainless steel and latches shall be three point locking for maximum security. A door restraint bar shall be provided to hold the door stationary when open. A heavy duty 3/4 inch rear back panel shall be provided to mount the service disconnect, meter and meter pan. Locking mechanism shall be keyed to the City of New York Traffic standards master system complete with four keys. The cabinet shall be rated NEMA 3R and be U. L. Listed.

Foundation

Cabinet foundation shall be constructed of reinforced class “A” concrete as detailed on the contract drawings.

Meter and meter pan

Metering equipment shall be U.L. listed and in accordance with the electrical utility standards and requirements and be self-contained, rated 120/240 single phase, 200 amp for mounting within the cabinet.

Load Center

The load center shall be service entrance rated, indoor type, mounted in the meter cabinet as indicated on the drawings. Mains shall be rated 240 volts, 2 pole, 125 amp main breaker with 12 mounting spaces for molded case, thermal magnetic branch circuit breakers with a short circuit rating of 10,000 AIC. Branch breakers shall be installed into the load center with the number and size as indicated on the plans. The enclosure shall be NEMA 1 for mounting within the cabinet and come complete with neutral bar and equipment grounding bar. The load center shall be U.L. listed.

Power Terminal blocks

Terminal blocks shall be installed into the meter cabinet to raise the wire size from the branch circuit breakers to the loads. Wire size ranges will vary with the load and distance. The Contractor shall submit shop drawings for each size used. All terminal blocks shall be rated heavy duty, 600 volts tubular screw box type, with an ampere range to match branch circuit breaker.

Wire and cable

Wire and cable used within the cabinet and to the electric utility shall be as sized as shown on the contract drawings and be rated RH/RHW/USE.

Ground rod

Ground rod shall be a minimum of 8 feet long, 3/4 inches in diameter made of copper Bering steel with cast bronze mechanical ground clamp for wiring.

CONSTRUCTION DETAILS:

The Contractor shall construct the meter cabinet as shown on the plans and as specified herein.

The Contractor shall prepare a shop drawing which details the complete connection to new meter cabinet and all components to be supplied.

A test shall be performed on each completed new meter cabinet before final connection is made. A high voltage 240 volt warning sign shall be fastened to the exterior face of the door.

The Contractor shall be responsible for obtaining electrical inspection to the electrical feeder and service equipment from the inspector and utility company and shall pay all fees for inspection and final connection.

METHOD OF MEASUREMENT:

The “METER CABINET” bid item will be measured for payment by the actual number activated, tested, and accepted.

BASIS OF PAYMENT:

Payment will be made at the contract unit price each for “METER CABINET” which shall include all equipment, material, testing, documentation, and labor detailed in the contract documents for this bid item. The price shall also include any internal conduit and cable.

ITEM 680.95663211 - RANGING RADAR DETECTOR ASSEMBLY

DESCRIPTION

This item will consist of furnishing and installing multi-channel ranging radar units at locations shown on the plans and in accordance with the conditions set forth. Each unit shall be a self-contained sensor which detects and monitors roadway traffic. The sensor shall be a true presence detector which can provide volume, lane occupancy, and speed information on at least eight discreet detection zones from a side-fire location. The detector information shall be available via an asynchronous serial communications line operated in a multi drop configuration utilizing an open protocol.

MATERIALS

The material shall contain all of the components described in the subsequent material specifications. All necessary incidental components, cables, and hardware, shall be supplied to accomplish a fully operational multi-channel radar unit installation. All equipment and component parts furnished shall be new, be of the latest design, and manufacture. All parts shall be of high quality workmanship, and no part or attachment shall be substituted or applied contrary to the manufacturer's recommendations and standard practices. The design life of all components, operating 24 hours per day, shall be ten (10) years minimum.

Ranging Radar Detector

Functional Requirements

The detector shall be mountable from a side fire location and shall comply with the following functional specifications:

- Shall comply with the limits of a Class A digital device pursuant to Part 15 of the FCC rules
- The unit shall not interfere with any known equipment
- The unit shall support at least eight lanes of traffic within the range of 9 feet to 200 feet from the sensor when the sensor is mounted at least 17 feet higher than the roadway profile
- The width and location of the detection zones shall be fully programmable via a PC interface. The unit shall retain its programming in non-volatile memory
- Basic resolution of the unit shall be 10 msec or less
- The reporting interval shall be set within the range of 10 to 600 seconds in increments of ten seconds
- The unit shall operate at 9600 baud or lower baud rate
- The unit shall support both contention and polled protocols. In contention mode, the unit shall report volume, average occupancy, and average speed over the reporting interval at the end of the interval. In polled mode, a communication address shall be assigned to the unit via its setup

program. Upon receiving a command from the center with the appropriate address, the unit shall respond with the accumulated volume, average occupancy, and average speed in the period since the last poll request was issued.

- Complete protocol descriptions shall be supplied with the submittal for the unit. These protocol descriptions shall be complete and adequate for the purpose of developing software to retrieve the information from the sensor.

- The unit shall not exceed 4.5 lbs in weight.

- Nominal dimensions for the unit shall be 14 inches X 11 inches X 7 inches, approximately.

- The unit shall operate in all prevalent traffic conditions, from 0 to 80 mph. Over this range, the unit shall be accurate to:

Volume	-	10% of Actual Count
Occupancy	-	The unit shall be able to measure and output occupancy
Speed	-	Within ±10 mph of true speed as measured by a radar gun. For instance, if true speed averages 50 mph, reported speed shall be 40 mph to 60 mph.
Classification	-	The unit shall be able to differentiate long from short vehicles within 20% of actual count

*Accuracy = ((sensor output-actual measured)/actual measured) x 100

Environmental Conditions

This equipment shall meet all its specified requirements during and after being subjected to any combination of the following conditions:

- The ambient temperature range shall be between -40°F to +165°F.

- Relative humidity up to 95 %, non-condensing.

- Rain or snow up to 2 inches per hour.

- Vibration of 2 g up to 200 Hz sinusoidal.

- Shock of 5 g 10 millisecond half sine wave.

The enclosure shall be a weather proof cabinet of cast aluminum, stainless steel, or polycarbonate meeting as a minimum the NEMA requirements for a 4X Type enclosure.

The design shall be inherently temperature compensated to prevent abnormal operation. The circuit design shall include such compensation as is necessary to overcome adverse effects due to

temperature in the specified environmental range. The unit shall not require programming changes to compensate for different environmental conditions encountered from season to season.

Power Requirements

- This unit shall operate on 12 to 30 VAC power at 60 Hz single phase supply and consumes no more than 4 watts.
- Surge protection shall comply with IEEE Standard 587-1980 Category C.
- Each unit shall have power failure recovery (automatic recovery after a power failure).

Mounting Bracket

The detector shall be supplied with a mounting bracket. The mounting bracket shall be designed to allow the detector to be mounted on a pole and shall utilize a ball-joint. The ball joint shall be equipped with a locking pin which will allow the detector to be mechanically aimed and secured in place. The ball joint will allow the unit to be tilted in both directions. The mounting bracket shall be supplied with stainless steel bands which will allow the unit to be attached to poles ranging from 1 to 20 inch diameter. The appropriate size band shall be supplied for the pole designated in the plans to which the unit will be mounted.

Interface Cable

A single composite interface cable shall be provided which will provide AC power to the top-of-pole assembly as well as full duplex RS232 data lines required to interface with a serial port on the Terminal Server in the equipment cabinet. The cable shall terminate in a metal MS connector rated for outdoor usage on the sensor side. The Terminal Server side of the cable shall be terminated with an RS232 connector suitable for connection to a serial port on the Terminal Server to be installed in the cabinet. The AC power shall be labeled and terminated with suitable connection to a standard AC service cord, as may be required for installation in the pole mounted control equipment cabinet and pole mounted equipment cabinet with rack. These cabinets are paid for under a different pay item. The ranging radar detector assembly interface cable shall be designed for outside use, shall utilize stranded wire and shall be of sufficient length to connect to the electronic equipment in these cabinets with no additional splices.

PC Diagnostic Software

A PC based diagnostic software package shall be provided which can operate under Windows Command Prompt, Windows 7 or Windows Server 2008. The diagnostic program shall fully support the programming of all parameters in the unit including type of protocol and detection zones. The program shall also display in real-time presence in the programmed detector zones and shall also report the accumulated data over the reporting interval for all programmed zones including volume, average occupancy, and average speed. An adapter cable shall be supplied which will allow an interface between a standard PC RS232 port and the connector utilized for the Terminal Server connection. In this regard, the cable shall allow a PC to communicate with the sensor in lieu of the Terminal Server at the field location.

ITEM 680.95663211 - RANGING RADAR DETECTOR ASSEMBLY

Terminal Server and Cable

A Terminal Server shall be provided which will allow a minimum of four (4) and up to sixteen (16) detectors to communicate with an Ethernet Switch. The Ethernet Switch will be connected to the RJ-45 port on the Terminal Server at the designated cabinet intended to return detector information. Each successive detector will be connected to a separate serial port on the Terminal Server. Using this device, it shall be possible for up to sixteen (16) devices to be uniquely addressed and connected to the same Ethernet Switch port at each location. The Terminal Server shall allow all serial ports to receive data transmitted from the Ethernet Switch port simultaneously. The Terminal Server will include circuitry which will allow all serial ports to transmit to the Ethernet Switch port simultaneously. The Terminal Server shall have logic to detect collisions caused by multiple host devices attempting to transmit simultaneously. One Terminal Server shall be required at each cabinet that a detector is to be installed in. Category 6 cable shall be supplied to connect the Terminal Server to the Ethernet Switch.

CONSTRUCTION DETAILS

The contractor shall prepare a shop drawing which details the complete radar unit assembly, all components to be supplied and the mounting hardware. These drawings shall detail the exact placement of each radar unit showing the height the unit is mounted at, the proposed detection zone and hardware mounting methods. These drawings shall also include details of the installation of a shielded communications cable from the radar unit to the pole mounted control equipment cabinet, including the installation of the RS232 cable harness used for installation and alignment of this unit. Upon request, the contractor may be required to perform a field demonstration of the assembly at a particular site which would be intended for approximating the conditions under which the sensor will need to operate for the project.

Utilizing factory trained personnel, the mounting bracket shall be mounted on the optimum height on the assigned pole. Via the use of a bucket truck or secured ladder, the assembly shall be physically pointed to provide optimum coverage for the travel lanes indicated on the plans to be covered. Once mechanically aimed, the PC diagnostic shall be utilized by the contractor to pin-point optimum detector width settings. In addition, the communication address assigned to the unit shall be programmed via the PC diagnostic. A radar gun shall be available for the purpose of estimating speed on the approach at the time that the assembly is mounted. This speed shall be provided to the diagnostic program for the purpose of calibrating speed measurements obtained for the assembly. Once programmed, a test shall be conducted verifying volume measurements against manual counts and speed measurements against radar gun readings. The unit shall operate within the tolerances included in the Functional Requirements specifications for volume, occupancy, and speed.

The splitter to be supplied shall be installed in the cabinet. The RS232 port of the detector shall be connected to the appropriate host port of the splitter. The modem port of the splitter shall be connected to the RS232 central transceiver port at that location which will return the detector information to the central site.

All components supplied under this specification shall be warranted in accordance with Section 104-08,

ITEM 680.95663211 - RANGING RADAR DETECTOR ASSEMBLY

Warranties and Guarantees of the Standard Specification.

METHOD OF MEASUREMENT

This item shall be measured for payment by the actual number of Ranging Radar Detector Assemblies installed, activated, tested, and accepted.

BASIS OF PAYMENT

This item shall be paid for at the contract unit price each for Ranging Radar Detector Assemblies which price shall include all equipment, material, testing, documentation, and labor detailed in the contract documents.

Progress payments will be made in the following percentages of the bid price for each item after each milestone is reached.

Operational Stand-Alone Test	40%
Group Site Verification Test	25%
Sub System Integration Test	25%
System Acceptance Test	10%

ITEM 680.99120011 – FIBER OPTIC INNERDUCT, 1 CHANNEL

DESCRIPTION:

This work shall consist of furnishing and installing fiber optic innerduct at locations shown in the Contract Documents and as directed by the Engineer.

MATERIALS:

All materials furnished, assembled, fabricated or installed under this item shall be new, corrosion resistant and in strict accordance with the details shown on the plans and in the Special Specifications.

The fiber optic innerduct shall be an individual channel conduit liner as specified on the plans and in the Special Specifications. The color of the innerduct shall be as indicated on the plans.

The innerduct shall have an inner diameter of 1 inch nominal and the outer diameter shall be such as to allow for the installation of four (4) channels within a 4 NPS conduit.

The innerduct shall be fabricated out of high molecular weight, high density polyethylene (HDPE) which shall conform to the following material requirements:

- Density: 0.946 g/cc (ASTM D4883).
- Melt Index: 0.25 g/cc (ASTM D1238).
- Tensile strength at yield: 3 ksi (ASTM D638).
- Elongation at break: 800 % minimum (ASTM D638).
- Flexural Modulus: 120 ksi (ASTM D790).
- Hardness (Shore D): 68.
- Deflection temperature at 294 N: 156^{o} F.
- Environ. stress crack resistance – Condition B: 1000 hrs minimum (ASTM D1693).
- Brittleness Temp: -180 ^{o} F maximum (ASTM D746).
- Cell Classification: 335440A (ASTM D3035).

The Contractor shall provide a drag line through the entire length of each of the individual channels of innerduct installed. The drag line shall be muletape or mylar tape and shall have tensile strength of 1000 lbs. minimum.

Fiber Optic Innerduct, 1 Channel shall be accepted upon the basis of the manufacturer's certification that it meets the requirements of this specification.

CONSTRUCTION DETAILS:

The innerduct shall be installed in conduits where specified in the contract plans. Prior to the installation of the innerduct, the Contractor shall clean all existing conduit and pullboxes as required and as specified under separate contract items.

If existing pullboxes require resetting or other modifications, this work shall be completed prior to the installation of innerduct into the subject pullbox.

The Contractor shall install the innerduct between pullboxes as shown on the plans and as directed by the Engineer. Channels of the same color entering a pullbox from different sides

shall be aligned so that cables installed in a specific channel can be directly pulled through the box without crossing cables installed in other channels. The innerduct shall run continuously through pullboxes, except at locations where slack fiber optic cable will be stored. At these pullboxes, the innerduct shall be extended at least 6 inches into the pullbox and secured or anchored in an approved method to prevent movement during cable pulling operations. (If this occurs, the innerduct shall be reconnected to form a continuous run using manufacturer approved compression couplings.) All proposed fiber optic cable lubricants shall be compatible with the innerduct material and shall be an approved product of the innerduct manufacturer. The Contractor shall provide certification of the lubricant compatibility to the Engineer for approval prior to installation.

The Contractor shall pull the specified innerducts in accordance with manufacturer recommended installation procedures. The installation procedures shall be delivered to the Engineer a minimum of ten working days prior to the start of installation. Guide wheels, bending shoes or quadrant guides shall be used to achieve a smooth transition from road grade to conduit depth. The innerduct shall have a 24 inch bend radius minimum. The Contractor shall fill the end of the innerducts with scrap cables or equivalent in order to avoid collapsing of the innerduct within compression grips.

The Contractor shall apply manufacturer approved pulling lubricants as necessary to ensure smooth, even pulls. The maximum pulling force shall be 1000 lbs.

At all locations where innerduct will terminate, the Contractor shall install sealing and termination plugs on all innerduct channels in order to prevent water or foreign matter ingress. The plugs shall be installed immediately after the innerduct is installed. If the Contractor's proposed fiber optic installation schedule coincides closely with the innerduct installation, the Engineer may waive end plug requirement for innerduct channels to be used in this project.

Each of the innerducts shall be tested for clear bore and proper installation by the Contractor in the presence of the Engineer.

METHOD OF MEASUREMENT:

The Fiber Optic Innerduct will be measured for payment as the number of linear feet of innerduct furnished and installed. The linear measurement will include the 6 inch extensions into the pullbox.

BASIS OF PAYMENT:

The unit price bid per foot of Fiber Optic Innerduct shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work.

All conduit and necessary pullbox cleaning will be paid for under separate contract items.

ITEM 683.09150011 – TRANSMIT TAG READER
ITEM 683.09150111 – TRANSMIT ANTENNA

DESCRIPTION

This work shall consist of furnishing and installing TRANSMIT Tag Readers and TRANSMIT Antennas in accordance with these Contract Documents.

MATERIALS

The Contractor shall furnish TRANSMIT tag readers (field processors) and antennas with associated software and any miscellaneous cables and mounting hardware required at each TRANSMIT location indicated in the Contract drawings.

Equipment cabinets for the TRANSMIT readers, communications equipment, antenna mounts to existing structures, and TRANSMIT Central Server Equipment will be furnished and installed under other contract items or by others.

To insure compatibility with the existing TRANSMIT system; the equipment shall be as follows:

TRANSMIT Tag Reader - JANUS Reader
TRANSMIT Antenna - VRC Lane Kit
manufactured by
Kapsch TrafficCom IVHS
6020 Ambler Drive, Mississauga, Ontario Canada L4W 2P1
905 624-3020 ktc.us.info@kaspsch.net WWW.kapsch.net

or equal as approved by the Engineer.

TRANSMIT Tag Reader

The tag reader shall meet the following requirements:

Protocol:	For interrogation of tags - Interagency Group (IAG). The Engineer will furnish protocol for communication between the Operations Center and the tag reader.
Reading Speed:	Up to eight lanes of traffic with vehicles traveling at 100 mph.
Frequency:	915.75 MHz.
Data Interface:	Ethernet
FCC Licensing:	Contractor shall be responsible for obtaining all licenses required by the Federal Communications Commission. The license shall be in the name of the New York State Department of Transportation.

ITEM 683.09150011 – TRANSMIT TAG READER
ITEM 683.09150111 – TRANSMIT ANTENNA

Distance from Antenna:	Operate up to 300 ft from the TRANSMIT Antenna.
Electrical:	115±20VAC, 145W
RF Modules:	One module for each antenna specified in the Contract Documents. The module shall be compatible with the Transmit Antenna.
Mechanical:	• Configured for mounting in EIA-19 rack • Maximum dimensions: 21 in (H) x 19 in (W) x 13 in (D) • Blank plates shall cover unused module slots
Environmental:	• Operating Temperature: -34°F to +185°F • Humidity: 5% to 95% non-condensing

TRANSMIT Antenna

The antenna shall be suitable for overhead mounting and shall meet the following requirements:

Electrical

- Frequency Range: 902 MHz to 930 Mhz.
- Gain: 9.5 ±1 dBi.
- VSWR: 1.3:1 maximum from 902-928 MHz.
- Impedance: 50 ohms.
- Beam width- horizontal: 60±5degrees.
- Beam width- vertical: 40±5 degrees.
- Polarization: horizontal.
- Cross polarization: less than 15 dB.
- Side Lobe Suppression: less than 17 dB

Mechanical

- Dimensions: 22” (H) x 11” (W) x 6” (D) maximum.
- Weight: 6 lbs, maximum.
- Rated Wind Velocity: 125 mph.
- Moment at 100 mph: 3.5 lbf (compliance depends on mounting structure).
- Reflector Material: Aluminum.

Connector:

A Type N coaxial connector shall be used to attach the coaxial cable to the antenna.

Coaxial Cable:

ITEM 683.09150011 – TRANSMIT TAG READER
ITEM 683.09150111 – TRANSMIT ANTENNA

The Contractor shall provide as part of the TRANSMIT antenna item appropriate coaxial cable to connect the antenna to the tag reader. The cable shall meet the following general requirements:

- Connector at antenna end: Compatible with antenna's connector.
- Connector at reader end: Type N, silver plated body and plated pin, male compatible with surge protector, 50 ohm impedance.
- Characteristic impedance: 50 ohms

Surge Protector:

A surge protector shall be provided in the equipment cabinet for each antenna. The surge protectors shall be in accordance with the tag reader manufacturer's recommendations.

CONSTRUCTION DETAILS

The Contractor shall install the tag reader into the cabinet designated in the Contract Documents and the antenna(s) as specified in the Contract Documents. Mounting shall be as shown in the Contract Documents. The Contractor shall connect the tag reader to the antenna lead-in cable through the surge protector(s) and connect the tag reader to the 120 VAC power bus in the cabinet. The Ethernet output from the tag reader shall be connected to the Ethernet Switch furnished as part of another item.

Surge protectors shall be installed in the equipment cabinet between the antennas and the tag reader. The surge protectors shall be grounded in accordance with the manufacturer's recommendations.

The coaxial cable shall be continuous from antenna to the surge protector located in the reader cabinet without any intermediate splices or connectors. Cable slack of 1 ft shall be left at the antenna location and cable slack of 1 ft shall be left at the reader cabinet for each coaxial cable. A weatherproof and permanent label shall be attached to the coaxial cable end in the reader cabinet end so that each cable can be identified as to antenna. The Contractor shall submit a label sample and labeling procedure to the Engineer for approval prior to installation of any coaxial cable or reader.

Documentation Requirements

Two (2) complete sets of operation and maintenance manuals shall be provided. The manuals shall, as a minimum, include the following:

- Equipment operation
- Complete installation procedures

ITEM 683.09150011 – TRANSMIT TAG READER
ITEM 683.09150111 – TRANSMIT ANTENNA

- Complete performance specifications (functional, electrical, mechanical and environmental)
- Complete and accurate troubleshooting, diagnostic and maintenance procedures

Testing Requirements

Reader Antenna

The Contractor shall test each reader antenna and interconnection to ensure that the reader antenna and coaxial cable has not been damaged during installation. Prior to connecting the reader antenna and coaxial cable at the site, the Contractor shall test each item separately. The following tests shall be performed:

- Each reel of coaxial cable shall be inspected at the Contractor's shop to insure no physical damage. A DC resistance, megger and a TDR shall be performed on each reel. Each reel shall be frequency swept from 850 to 950 Mhz.
- Prior to installing the antenna the Contractor shall physically inspect the antenna for damage, perform a VSWR test on the antenna and measure the antenna's impedance.
- After installation of the antenna and coaxial cable at the site, the Contractor shall perform a physical inspection of each item to verify that it has not been damaged during installation, perform a TDR test, DC ohm test and megger test on the installed coaxial cable as recommended by the cable manufacturer and perform an impedance measurement on the antenna.
- After connection of the coaxial cable to the antenna and all connectors, the Contractor shall a frequency sweep of 850 to 950 MHz and a TDR test from the cabinet.

Operational Test

The Contractor shall perform an Operation Test for each TRANSMIT Site after the antenna(s) have been connected to the Tag Reader.

The Contractor shall verify that vehicles with tags are correctly interrogated by the tag reader. Ninety-five percent (95%) of all tagged vehicles passing within the antenna's field shall be correctly interrogated. This test shall be performed locally from the reader cabinet and remotely from the operations center rack room. Rack room space will be provided by the State. All equipment necessary to perform the test shall be provided by the Contractor.

The integration of each TRANSMIT site into the TRANSMIT system will be performed under other contract items or by others.

METHOD OF MEASUREMENT

The TRANSMIT Tag Reader and TRANSMIT Antenna will be measured for payment as the number of units furnished, installed, made fully operational and tested.

ITEM 683.09150011 – TRANSMIT TAG READER
ITEM 683.09150111 – TRANSMIT ANTENNA

BASIS OF PAYMENT

The unit price bid shall include the cost of all required labor and equipment to furnish, install (TRANSMIT antennas/readers), integrate, and test the TRANSMIT equipment. Payment for the TRANSMIT reader cabinet shall be included under separate contract items.

Payment for the coaxial cable used to connect the antenna to the tag reader will be included under TRANSMIT Antenna item. Payment will be as follows for the TRANSMIT Antenna:

- Twenty percent (20%) of the bid price for the TRANSMIT Antenna will be paid after passing the sweep and TDR Tests for the interconnect antenna and coaxial cable.
- Twenty percent (20%) of the bid price for the TRANSMIT Antenna will be paid after installation in the field cabinet and connection to the tag reader through the surge protector.
- Twenty-five percent (25%) of the bid price for the TRANSMIT Antenna will be paid after completion of the local operations test.
- Twenty-five percent (25%) of the bid price for the TRANSMIT Antenna will be paid after completion of the remove operations test.
- Ten percent (10%) of the bid price for the TRANSMIT Antenna will be paid upon system acceptance.

Payment will be as follows for the TRANSMIT Tag Reader

- Twenty-five percent (25%) of the bid price for the TRANSMIT Tag Reader will be paid after installation into the designated cabinet, connection to the power and ground buses and connection the TRANSMIT Antenna through the surge protector.
- Forty-percent (40%) of the bid price for the TRANSMIT Tag Reader will be paid after completion of the local operations test.
- Twenty-five percent (25%) of the bid price for the TRANSMIT Tag Reader will be paid after completion of the remote operations test.
- Ten-percent (10%) of the bid price for the TRANSMIT Tag Reader will be paid after system acceptance.

ITEM: 683.10110008 - HD IP CAMERA ASSEMBLY - BARREL TYPE
ITEM: 683.10120008 - HD IP CAMERA ASSEMBLY - DOME TYPE
ITEM: 683.10130008 - HD IP CAMERA ASSEMBLY - SOLAR POWERED DOME TYPE

DESCRIPTION:

This work shall consist of furnishing and installing HD IP Camera Assemblies at the locations shown in the plans and as directed by the Engineer. These Camera assemblies shall contain all of the accessories, cables, components, software/ licenses and support documents described in the material specification and shall be configured as indicated on the contract document.

The HD IP Camera Assemblies shall have full HD 1080p30 image resolution with integral 30x optical zoom lens. The camera operation shall include true day-night with variable speed pan and tilt technology with a minimum sensitivity of 0.025 lux @30 IRE. The HD IP Camera Assemblies shall provide 3 or more independent output video streams configurable for H.264 and MJPEG outputs.

MATERIALS:

All materials furnished, assembled, fabricated, or installed shall be new, corrosion resistant, and in strict accordance with the standards set by the New York State Department of Transportation (NYSDOT). Each of the HD IP CCTV Camera Assembly types shall deliver high quality full-motion video during day or night operation with the video and control/status data transmitted over a communications network.

The HD IP Camera Assembly shall contain the Camera optics, Sensor, H.264/MJPEG Encoder, and Pan/Tilt/Zoom motor as an integrated unit. External connections to the camera shall include power over Ethernet (PoE) injector for digital video and IP based controls. An alternative 24 VAC power supply shall also be included.

Each type of CCTV Camera Assembly shall consist of a solid state color/monochrome CCTV camera with infra-red cut filter, motorized zoom lens, pressurized enclosure, pan/tilt unit, integral camera control receiver, and all cabling required to interface the HD IP CCTV Camera Assembly with equipment in the field cabinet.

The HD IP CCTV Camera mounting shall be furnished and installed for mounting on poles or walls as shown in the plans and as directed by the Engineer. Connections between the equipment shall be through water proof connectors. The connectors and cables shall be reviewed and approved by the regional TMC prior furnishing.

Repair, replacement, and parts service for the HD IP CCTV Camera Assembly shall be available within the contiguous United States or Canada. The Barrel, Dome and Solar Powered Dome Type CCTV Camera Assemblies shall be compliant with the latest version of the NTCIP Standards, as defined by AASHTO, ITE, and NEMA.

The assembly shall include "pre-set" capability, which shall allow the camera to be automatically commanded to a predefined position via the camera control software supplied under this specification. The Contractor shall provide a totally operational assembly with all cabling and terminations matched to support the selected components.

HD IP Camera Requirements:

The Barrel Type HD IP CCTV Camera Assembly, Dome Type HD IP CCTV Camera Assembly,

ITEM: 683.10110008 - HD IP CAMERA ASSEMBLY - BARREL TYPE
ITEM: 683.10120008 - HD IP CAMERA ASSEMBLY - DOME TYPE
ITEM: 683.10130008 - HD IP CAMERA ASSEMBLY - SOLAR POWERED DOME TYPE

and Solar Powered Dome Type HD IP CCTV Camera Assembly shall meet the following minimum requirements:

General

Weight:

- Barrel: 30 pounds (max)
- Dome: 16 pounds (max)
- Solar Powered Dome: 16 pounds (max)

- Dimensions
  - Barrel: 16.5 inches (w) x 13 inches (h) x 14 inches (L) (max)
  - Dome: 12.25 (w) x 14 inches (h) (max)
  - Solar Powered Dome: 12.25 (w) x 14 inches (h) (max)
- Temperature Range -30 degrees F to +160 degrees F (operating)
- Humidity 0 – 100% relative humidity
- Wind meets all performance criteria when subjected to a 75 mph wind and able to withstand a 125 mph wind.
- Holding Torque: Maintains current position in winds of 75 MPH or higher with TS2 vibration conditions. Operates and moves to any position in winds of 75 MPH or higher at worst case orientation to the wind.
- Power Feed: PoE++ shall be provided as part of this item and mounted in the equipment cabinet. The Cabinet is provided as part of another pay item.
- Power Consumption:
  - Barrel: 100 W (max) including heater/defogger
  - Dome: 70 W (max) including heater/defogger
  - Solar Powered Dome: 30 W (max) including heater/defogger
- Network and Electrical Interfaces
  - Outdoor Rated Cat. 6 Cable
  - Alternate Power and control cables between the CCTV Camera Assembly and the associated field cabinet shall be in accordance with the manufacturer's recommendations. Shop drawings showing the configuration of the harness along with the manufacturer's recommendations shall be submitted to the Engineer for approval prior to fabrication.
  - Electrical connections between the positioning device and camera/lens shall be through a pre-wired feed-through rather than through a wiring harness.
- Enclosure:
  - Barrel: IP67/ NEMA Rating 4X
  - Barrel sunshield extends beyond viewing window to prevent sun glare on the lens
  - Dome: IP67/ NEMA Rating 4X

  - Solar Powered Dome: IP67/ NEMA Rating 4X
  - Enclosure: All hardware shall be stainless steel.
  - Enclosure Pressure: Enclosure shall be factory pressurized to prevent the ingress of water, dust and windblown particles, per the requirements of the NEMA rating. The IP67 rated enclosure shall be warranted for the lifetime of product against any moisture ingress.
  - The manufacture IP67/NEMA 4X certificate of compliance or testing result shall be submitted as requested by the Engineer.

- Heater/defroster/defogger: A built in thermostatically controlled heater/defroster/defogger shall be provided, if the operation of the camera at specific environment range required heater/ defroster/defogger. The defroster/defogger shall prevent icing and fogging of the viewing window. The heater shall be sized and thermostat set to permit operation of the camera over the specified environmental conditions. A minimum of 40° F hysteresis shall be provided in the thermostat to prevent continuous cycling of the heater, blower, defroster or defogger. Either snubbers or Metal Oxide Varistors (MOV) of appropriate ratings shall be installed across the switch outputs of all thermostats. The MOVs shall be connected to ground.

- Display Text Labels:

  - Label texts shall be positioned such that they do not interfere with the view.
  - Labels text shall be able to be disabled as necessary.
  - Label Information: Camera ID 20 alphanumeric characters (min)
  - Label Information: Preset ID
  - Label Information: Low/High Temperature
  - Label Information: Low/High Pressure (As direction of the Engineer this label may not require if the manufacture of the camera warranties for life of camera that no moisture will ingress into its IP67 enclosure)

Camera

- Image Sensor: 1/2.8” CMOS, Scanning Progressive
- Resolution 1,920 x 1,080
- Frame Rate 30 fps
- Camera Format Day/Night (IR Cut Filter)
- Day/Night Modes Auto, Color, B/W
- Color Sensitivity at 33 ms and f1.4: 0.4 lux (0.04 fc) or better
- B/W Sensitivity at 33 ms and f1.6: 0.04 lux (0.004 fc) or better
- Color Sensitivity at 500 ms and f1.4: 0.025 lux (0.0025 fc)or better
- B/W Sensitivity at 500 ms and f1.6: 0.0025 lux (0.00025fc)or better
- Zoom Lens: 30x, 4.4 to 132mm (Minimum)
- Typical Aperture: f1.4 -> f4.6
- Horizontal Angle of View: Minimum 63.4° to 2.3°
- Focus: Auto/Manual (Near, Far)
- Focus Search: Normal, Bright, Point Source
- Focus Sensitivity: Low, Normal, High

ITEM: 683.10110008 - HD IP CAMERA ASSEMBLY - BARREL TYPE
ITEM: 683.10120008 - HD IP CAMERA ASSEMBLY - DOME TYPE
ITEM: 683.10130008 - HD IP CAMERA ASSEMBLY - SOLAR POWERED DOME TYPE

- Iris: Auto/Manual(Open/Close)
- Digital Zoom: 12x, Off/On (Depth)
- A Defog Mode Function/ Analytics: Off/Auto with user configuration setting/Manual with defog and haze enhancement Levels,
- Image Stabilization Mode Function: Off/On Level adjustment
- Enhanced Intensity Function: Off, Enhanced, Whiteout Reduction Level adjustment
- Dynamic Range Function: Gretter than 90dB in Normal/Combo/Contrast Level adjustment
- Back Light Comp Function: Off/On Level Setting
- Auto Electronic Shutter (AES): Auto/Manual, range 1/2 -> 1/30,000 or as approved by the Engineer
- Slow Shutter Off/On, range 1/15->1/2 or as approved by the Engineer
- IR Correction: Off/On [850nm]
- White Balance: Auto/Manual
- (WB) Modes Normal, Mercury, Sodium Vapor
- Automated Gain Control (AGC): Adjustable 1 to 48db or as approved by the Engineer
- Sharpness Soft, Normal, Sharp, Sharpest
- Noise Reduction: Normal, Medium, Strong, Fixed Levels

Camera PTZ

- Barrel Type Camera
  - Pan Range: 360° continuous rotation
  - Tilt Range: +90° to -90°
  - Manual Pan Speed: 0.05° to 45°/second
  - Manual Tilt Speed: 0.05° to 45°/second
  - Speed Resolution: 16 or 64 Variable Speed Levels
  - Preset Speed: 180° < 2.5 Seconds
  - Accuracy: +/- 0.05°
  - Resolution: +/- 0.05°
  - Presets: 512, Includes pan, tilt, zoom, focus, and preset ID, I/O output state
  - Tours: 512, Includes presets with dwell, speed, and direction and recurrence properties
  - Auto Park: Returns to a preset or tour after timer expires,
  - Privacy Masks: Minimum 8/16 – user defined mask area
  - Firmware Updating: Via Ethernet connection
- Dome Type Camera
  - Pan Range: 360° continuous rotation
  - Tilt Range: +10° to -90°
  - Pan Speed: 0.1° to 45°/second
  - Tilt Speed: 0.1° to 45°/second
  - Speed Resolution: Greater than 64 Variable speed levels
  - Preset Speed: 180° movement on less than 1.5 Seconds
  - Repeatability: +/- 0.1°
  - Resolution: +/- 0.1°

  - Presets: 512, Includes pan, tilt, zoom, focus, preset ID, I/O output state
  - Tours: 512, Includes presets with dwell, speed, and direction and recurrence properties
  - Auto Park: Returns to a preset or tour after timer expires,
  - Privacy Masks: Minimum 8/16 – user defined mask area
  - Firmware Updating: Via Ethernet connection

- Solar Powered Dome Type Camera
  - Pan Range: 360° continuous rotation
  - Tilt Range: +10° to -90°
  - Pan Speed: 0.1° to 45°/second
  - Tilt Speed: 0.1° to 45°/second
  - Speed Resolution: Greater than 64 Variable speed levels
  - Preset Speed: 180° movement on less than 1.5 Seconds
  - Repeatability: +/- 0.1°
  - Resolution: +/- 0.1°
  - Presets: 512, Includes pan, tilt, zoom, focus, preset ID, I/O output state
  - Tours: 512, Includes presets with dwell, speed, and direction and recurrence properties
  - Auto Park: Returns to a preset or tour after timer expires,
  - Privacy Masks: Minimum 8/16 – user defined mask area
  - Firmware Updating: Via Ethernet connection

Video Streams

- Video Streams: Minimum three video streams
- Video Encoding: H.264 Base, Main and High Profiles, MJPEG
- Video Protocols: RTSP/RTP, RTSP Interleave, HTTP Tunneling, RTP Multicast
- Video Resolution: 1080p, 720p, D1, CIF, QCIF
- Video Frame Rate: 1 to 30, 30 default
- Video Data Rate: 256Kbs to 8Mbs
- Video Rate Control: Variable or Constant Bit Rate
- Video Latency for Four frames base: 0.133 sec. or better
- Video Transmission: 99.999% error free or better

Network Interfaces

- Ethernet: 802.3u 100Base-T, MDI-X auto-sensing, full duplex
- Digital Inputs: Minimum two (2) Sensor Inputs, Dry contact, N.O or N.C
- Digital Outputs: Minimum two (2) Control Output, Open collector
- Protocol: TCP, UDP, IPv4, IGMP, ICMP, DNS, DHCP, RTP, RTSP, RTCP, NTP, HTTP, SOAP, HTTPS ARP, FTP, SMTP, Telnet. ONVIF Profile S
- Media Players: VLC, Quick Time, Compliant media player with RFC 2326, 3984, 3550, 2435, ISO/ IEC 13818-1
- ONVIF: Profile S
- Camera Control: NTCIP, ONVIF Profile S
- Security: Admin, Operator User, Anonymous User, Digest Authentication Levels

- Updates File: Over network using camera web server interface

Certifications

- FCC Class A
- CE
- RoHS
- NTCIP
- ONVIF Profile S

To ensure compatibility and interchangeability with equipment furnished in previous and future contracts, the Barrel, Dome, and Solar Powered Dome Type HD IP CCTV Camera Assemblies shall be compliant with the latest version of the NTCIP Standards, as defined by AASHTO, ITE, and NEMA. The following conformance groups within the NTCIP 1205:2001 standard shall be supported with the values defined in these tables. For the purposes of this specification NTCIP 1205 Conformance Statements shall be considered mandatory, except where noted.

CONFORMANCE STATEMENTS

Object or Table Name	Reference	Conformance Requirement Within the Group
Configuration	NTCIP 1201:1996	Mandatory
Database Management	NTCIP 1201:1996	Amendment 1 Optional
Time Management	NTCIP 1201:1996	Amendment 1 Optional
CCTV Configuration	NTCIP 1205	Mandatory
Extended Functions	NTCIP 1205	Mandatory
Motion Control	NTCIP 1205	Mandatory
On-Screen Menu Control	NTCIP 1205	Optional

CCTV Configuration Conformance Group

MIB	Object or Table Name	NTCIP Reference	NYSDOT Specification Section Reference	Expected Valve
3.2.1	RangeMaximumPreset	NTCIP 1205	**3.2**	32 to 255
3.2.2	rangePanLeftLimit	NTCIP 1205	3.4	35999
3.2.3	rangePanRightLimit	NTCIP 1205	3.4	35999
3.2.4	rangePanHomePosition	NTCIP 1205	**3.5**	**0**
3.2.5	trueNorthOffset	NTCIP 1205	**3.5**	**0**
3.2.6	rangeTiltUpLimit	NTCIP 1205	**3.4.1 (Positioner)**	**9000**
			3.4.2 (dome)	**1000**
3.2.7	rangeTiltDownLimit	NTCIP 1205	**3.4.1**	**27000** **27000**
			3.4.2	**27000**
3.2.8	rangeZoomLimit	NTCIP 1205	**2.6**	65535
3.2.9	rangeFocusLimit	NTCIP 1205	**2.7**	65535
3.2.10	rangeIrisLimit	NTCIP 1205	**2.8**	65535

ITEM: 683.10110008 - HD IP CAMERA ASSEMBLY - BARREL TYPE
ITEM: 683.10120008 - HD IP CAMERA ASSEMBLY - DOME TYPE
ITEM: 683.10130008 - HD IP CAMERA ASSEMBLY - SOLAR POWERED DOME TYPE

MIB	Object or Table Name	NTCIP Reference	NYSDOT Specification Section Reference	Expected Valve
3.2.11	rangeMinimumPanStepAngle	NTCIP 1205	**3.4**	5
3.2.12	rangeMinimumTiltStepAngle	NTCIP 1205	3.4	5
3.3.1	timeoutPan	NTCIP 1205	-	0-65535
3.3.2	timeoutTilt	NTCIP 1205	-	0-65535
3.3.3	timeoutZoom	NTCIP 1205	-	0-65535
3.3.4	timeoutFocus	NTCIP 1205	-	0-65535
3.3.5	timeoutIris	NTCIP 1205	-	0-65535
3.11.1	labelMaximum	NTCIP 1205	**3.6**	9..255
3.11.2	labelTable	NTCIP 1205	**3.6**	
3.11.2	labelEntry	NTCIP 1205	**3.6**	
3.11.2.1	labelIndex	NTCIP 1205	**3.6**	0..255
3.11.2.2	labelText	NTCIP 1205	**3.6**	0..255
3.11.2.3	labelFontType	NTCIP 1205	**3.6**	1
3.11.2.4	labelHeight	NTCIP 1205	**3.6**	0..255
3.11.2.5	labelColor	NTCIP 1205	**3.6**	0
3.11.2.6	labelStartRow	NTCIP 1205	**3.6**	0..255
3.11.2.7	labelStartColumn	NTCIP 1205	**3.6**	0..255
3.11.2.8	labelStatus	NTCIP 1205	**3.6**	Bit 7 = 0,1 Bit 6 = 0,1
3.11.3	labelLocationLabel	NTCIP 1205	**3.6**	0..255
3.11.4	labelEnableTextDisplay	NTCIP 1205	**3.6**	Bit 7 = ON

Extended Functions Conformance Group

MIB	Object Or Table Name	NTCIP Reference	NYSDOT Specification Section Reference	Expected Value
3.6.1	systemCameraFeatureControl	NTCIP 1205	1.6, 3.7	Byte 1 Bit 7 = 0,1 Bit 6 = 0,1 Bit 5 = 0 Bit 4 = 0 Bit 3 = 0 Byte 2 Bit 7 = 1

ITEM: 683.10110008 - HD IP CAMERA ASSEMBLY - BARREL TYPE
ITEM: 683.10120008 - HD IP CAMERA ASSEMBLY - DOME TYPE
ITEM: 683.10130008 - HD IP CAMERA ASSEMBLY - SOLAR POWERED DOME TYPE

MIB	Object Or Table Name	NTCIP Reference	NYSDOT Specification Section Reference	Expected Value
3.6.2	systemCameraFeatureStatus	NTCIP 1205	1.6, 3.7	Byte 1 Bit 7 = 0 Bit 6 = 0,1 Bit 5 = 0,1 Bit 4 = 0 Bit 3 = 0
3.6.3	systemCameraEquipped	NTCIP 1205	1.6, 3.7	Bit 7 = 1 Bit 6 = 1 Bit 5 = 0 Bit 4 = 0 Bit 3 = 0
3.6.4	systemLensFeatureControl	NTCIP 1205	2.6, 2.7, 2.8	Byte 1 Bit 7 = 0,1 Bit 6 = 0,1 Byte 2 Bit 7 = 0,1
3.6.5	systemLensFeatureStatus	NTCIP 1205	2.6, 2.7, 2.8	Byte 1 Bit 7 = 0,1 Bit 6 = 0,1
3.6.6	systemLensEquipped	NTCIP 1205	2.6, 2.7, 2.8	Byte 1 Bit 7 = 1 Bit 6 = 1
3.7.1	alarmStatus	NTCIP 1205	3.3	Bit 7 = 0 Bit 6 = 0 Bit 5 = 0 Bit 4 = 0,1 Bit 3 = 0,1 Bit 2 = 0 Bit 1 = 0
3.7.2	alarmLatchStatus	NTCIP 1205	**3.3**	Bit 7 = 0 Bit 6 = 0 Bit 5 = 0 Bit 4 = 0,1 Bit 3 = 0,1 Bit 2 = 0 Bit 1 = 0

ITEM: 683.10110008 - HD IP CAMERA ASSEMBLY - BARREL TYPE
ITEM: 683.10120008 - HD IP CAMERA ASSEMBLY - DOME TYPE
ITEM: 683.10130008 - HD IP CAMERA ASSEMBLY - SOLAR POWERED DOME TYPE

MIB	Object Or Table Name	NTCIP Reference	NYSDOT Specification Section Reference	Expected Value
3.7.3	alarmLatchClear	NTCIP 1205	**3.3**	Bit 7 = 0 Bit 6 = 0 Bit 5 = 0 Bit 4 = 0,1 Bit 3 = 0,1 Bit 2 = 0 Bit 1 = 0
3.7.4	alarmTemperatureHighLowThreshold	NTCIP 1205	Not Applicable	
3.7.5	alarmTemperatureCurrentValue	NTCIP 1205	Not Applicable	
3.7.6	alarmPressureHighLowThreshold	NTCIP 1205	Not Applicable	
3.7.7	alarmPressureCurrentValue	NTCIP 1205	Not Applicable	
3.7.8	alarmWasherFluidHighLowThreshold	NTCIP 1205	Not Applicable	
3.7.9	alarmWasherFluidCurrentValue	NTCIP 1205	Not Applicable	
3.7.10	alarmLabelIndex	NTCIP 1205	1.3, 1.11	Byte 1 = 0 Byte 2 = 0 Byte 3 = 0 Byte 4 = 0 Byte 5 = 0 Byte 6 = 0 Byte 7 = 0
3.8.1	inputStatus	NTCIP 1205	Not Applicable	
3.8.2	inputLatchStatus	NTCIP 1205	Not Applicable	
3.8.3	inputLatchClear	NTCIP 1205	Not Applicable	
3.8.4	inputLabelIndex	NTCIP 1205	Not Applicable	
3.9.1	outputStatus	NTCIP 1205	Not Applicable	
3.9.2	outputControl	NTCIP 1205	Not Applicable	
3.9.3	outputLabelIndex	NTCIP 1205	Not Applicable	
3.10.1	zoneMaximum	NTCIP 1205	**3.9**	0
3.10.2	zoneTable	NTCIP 1205	**3.9**	INTEGER
3.10.2.1	zoneIndex	NTCIP 1205	**3.9**	1..255
3.10.2.2	zoneLabel	NTCIP 1205	**3.9**	1..255
3.10.2.3	zonePanLeftLimit	NTCIP 1205	**3.4 , 3.9**	0..35999
3.10.2.4	zonePanRightLimit	NTCIP 1205	**3.4 , 3.9**	0..35999
3.10.2.5	zoneTiltUpLimit	NTCIP 1205	3.4.1, 3.9 3.4.2, 3.9	0..3300 0--200
3.10.2.6	zoneTiltDownLimit	NTCIP 1205	3.4.1, 3.9 3.4.2, 3.9	0..26300 0..27000

Motion Control Conformance Group

MIB	Object Or Table Name	NTCIP Reference	NYSDOT Specification Section Reference	Expected Value
3.10.1	zoneMaximum	NTCIP 1205	Not Applicable	
3.4.1	presetGotoPosition	NTCIP 1205	3.2	0..n
3.4.2	presetStorePosition	NTCIP 1205	3.2	0..n
3.5.1	positionPan	NTCIP 1205	3.4	4 Byte msg
3.5.2	positionTilt	NTCIP 1205	3.4	4 Byte msg
3.5.3	positionZoomLens	NTCIP 1205	3.4	4 Byte msg
3.5.4	positionFocusLens	NTCIP 1205	3.4	4 Byte msg
3.5.5	positionIrisLens	NTCIP 1205	3.4	4 Byte msg – Only support continuous iris movement

n = number of presets supported by the CCTV Camera Assembly

Field HD IP Camera Assembly Requirements:

Provisions shall be made in the HD IP Camera Assembly for the installation of all accessories, cables, connectors, mounting hardware and equipment which are required for the full operation of the CCTV camera. The following equipment cabling shall be provided under other contract items:

a. Surge Protectors: All outputs/inputs cables from the camera including Ethernet cable, power cable and video and data shall be protected by individual surge protector. The surge protectors shall be the same or equal as:
   - Emerson Edco-Cat6-PoE
   - Emerson Edco-CX06-MI
   - Emerson Edco-PC642
   - Emerson Edco-PHC

b. Power Injector or 24 VAC Power Supply: The contractor shall furnish and install the Power Injector or power supply unit as per the Regional TMC. The Power Injector or power supply shall comply with camera manufacture requirements and shall be a ruggedized unit.

c. Video Monitoring and PTZ control Software: The contractor shall furnish and install the video monitoring and control software as per camera manufacture recommendations and the Regional TMC integration requirement guidelines. The Contractor shall furnish and install all necessary licenses for full software operation and testing. All software shall be the latest version from the vendor with expiration date beyond the project closeout date.

d. Camera Cabling: The Contractor shall furnish all Input/Out puts cables from the HD IP camera to the field equipment cabinet. These cables shall include, Ethernet, Power, Grounding, Video, Data, Control and I/O signal. The Cables shall be outdoor rated applicable for vertical

installation. The Contractor's cabling submittal shall include the camera cables with Camera Pole Lowering device connectors, if such lowering device is applicable to the project

e. Camera equipment and cables labels: The Contractor shall submit the complete label information of all HD IP Camera equipment and cables labels. The Labeling shall comply with the Regional Transportation Management Center (TMC) labeling format and standard requirements. All label materials shall be industry rated with minimum 10 year life time. The contractor can request a copy of the Regional TMC labeling format and standard.

f. Camera Alarm Interface/ Contacts – The Camera Alarm signal shall be connected to the Field Equipment cabinet. The Contractor shall furnish terminal and relays for connection to the cabinet Non-IP Alarm monitoring Unit. The Non-IP Alam Monitoring Unit will be paid under separate pay item.

g. Workmanship - Workmanship shall conform to the requirements of this specification and be in accordance with the highest industry standards.

h. All incidental parts necessary to complete the installation but not specified herein or on the plans shall be provided as necessary to provide a complete and properly operating system.

i. Manufacturer's extended warranty: The contractor shall transfer the HD IP Camera manufacture warranty service for a period of thirty six (36) months from the delivery date of the system under normal use and service.

The Contractor shall submit a detailed dimensional drawing and the HD IP Camera equipment general layout of each type of components used in the camera assembly with data sheet or cut sheet submittal for review by the Regional TMC Engineer. Only HD IP Camera Assembly items with approve.

Layouts will be accepted under this Contract. After HD IP Camera equipment general layout and components approval contractor shall submit the detail schematic drawing for review by the regional TMC engineer.

CONSTRUCTION DETAILS:

The HD IP Camera Assembly shall be installed on a designated CCTV pole or structure as shown on the plans along with conduit fittings necessary to bring cables from the camera to the designated field equipment cabinet. Each HD IP Camera Assembly shall be installed such that the line of sight of the camera is in the center line of the desired field of view when the camera is in the midpoint of the desired motion between the limit stops.

Each HD IP Camera Assembly shall be installed such that the home position for each camera shall be set to true North. The Regional TMC Engineer will provide the field of view of each camera, the limit settings of its vertical and horizontal movements and the programmable parameters prior to installation. The Contractor shall furnish and install the mounting hardware, including brackets, mounting plates, bolts, connectors, cabling between the camera housing and equipment cabinet, and weather heads required for the installation of the HD IP Camera Assembly. The Contractor shall install and connect the camera cables between the HD IP Camera Assembly and the

equipment cabinet in accordance with the manufacturer's recommendations.

The Contractor shall program and configure the HD IP Camera with a minimum of two digital view streams. The Video streams shall have maximum and minimum transmission bandwidths. The High quality video shall be designated to the Regional TMC and low quality video for other applications. As per Regional TMC direction the Contractor shall program the Camera presets and the camera display labels. The contractor shall coordinate with the Regional TMC regarding the video quality and maximum and minimum bandwidth requirement. The contractor shall document all configuration and programming of the camera and the document shall be submitted to the Regional TMC.

HD IP Camera Assembly Final Test:

Each HD IP Camera Assembly shall be field inspected and tested by the Regional TMC Engineer. The Contractor shall provide the HD IP Camera Assembly testing plan and check list with following items:

1. HD IP Camera unit (Model, manufacture, MAC Address, Serial NO.)
2. Camera Mounting
3. Camera assembly on the Lowering Device (If Lowering device is used)
4. Camera Cables connection at the Field equipment Cabinet Check
5. Camera Cables Labels and Installation Check
6. Camera Surge Protector installation and function test (Test as per manufacture recommendation)
7. Camera Cables Test
8. Camera Connection to Power and Network
9. Camera Setting and Configuration Test:
   a- IP Addressing (IP addresses, Ports, VLAN, Multicasting)
   b- High Quality Video Stream (Visual test, Video Latency, Bandwidth, Frame Rate, S/N, Error Rate, Zoom(1-30), Focus (Manual-Auto), and image stabilization Checks)
   c- Low resolution Video Stream (Visual test, Video Latency, Bandwidth, Frame Rate, S/N, Error Rate, Zoom(1-30), Focus (Manual-Auto), and image stabilization Checks)
   d- PTZ Control Test via Ethernet Port (Pan (1-Max), Tele (1-Max), Movement Latency (less than 1.5 Sec for 360 degree Checks)
   e- PTZ Control Test via Serial Data Port- If applicable (Pan (1-Max), Tele (1-Max), Movement Latency (less than 1.5 Sec for 360 degree Checks)
   f- NTCIP Protocol PTZ Control Test
   g- Video Related Protocol Test
   h- Data Protocol Test
   i- Analog Video Quality Check- If applicable
   j- Home Parking Preset Test
   k- Presets Programming and Test (minimum 8 Presets Check)
   l- Tours Programming and Test (minimum 8 Tours Check)
10. Camera Control/Monitor Software Test (Software to be installed in NYSDOT Notebook)
11. Camera Power source Check
12. Camera Power Injector or Supply Voltage measurement

13. Camera Ground resistant measurement Check (Test may performed during the installation and the data has been documented)
14. HD IP Camera Equipment at the Field Cabinet Grounding check
15. HD IP Camera Equipment at the Field Cabinet mounting (safety and secure installation) check
16. Camera Equipment Labeling (format and material)
17. Camera cables and wiring Labeling (format and material)
18. HD IP Camera Assembly Layout Drawing Check
19. HD IP Camera Assembly Internal Wiring Diagram Drawing Check
20. Camera Equipment and Cables Check list

The contractor shall prepare the above test procedures and check lists and submit to the Engineer for review a minimum of 60-Days prior to test schedules.

All Operation, monitoring and control tests shall be completed in a local mode (Stand-Alone Test Action at each field location with no network connectivity), Remote mode (remote access to the site via network with HD IP camera software) and Central mode test (Test via the Regional TMC existing video management system). The Integration of the HD IP Camera to the existing the Regional TMC video management system will be performs bythe Regional TMC. The contractor shall coordinate this integration with the Regional TMC.

Documentation:

Two submittals of the HD IP Camera Assembly Drawing Package shall be sent to the Regional TMC for review and approval. These submittals are:

- HD IP Camera Assembly Submittal, the Contractor shall make this submittal in advance prior to camera integration and wiring and equipment assembly. The camera assembly drawings package shall include but not limited to:
    - HD IP Camera Assembly equipment Manufacture Cut Sheets
    - HD IP Camera Assembly Layout (all physical dimensions and assembly details shall be included)
    - Camera Mounting details (including Lowering device mounting details and all mounting hardware details)
    - HD IP Camera Assembly Equipment at the Field Equipment Cabinet Placement
    - HD IP Camera Assembly Power, Communication/Network and Control Diagrams (all AC power, assign CB and power wires shall be included)
    - HD IP Camera Assembly Communication/Network, control wiring Diagram (all equipment connections and interfaces shall be included)
    - HD IP Camera Assembly equipment, cables and wiring labeling details

Final HD IP Camera Assembly Drawing Package, The HD IP Camera Assembly Drawing Package shall be approved by the regional TMC prior to final acceptance of HD IP Camera Assembly. The HD IP Camera Assembly drawings package shall include but not limited to:

- HD IP Camera Assembly, pole, pull boxes and cables Location Layouts. This Record Drawings shall include location of Pole, cabinet, camera and its equipment and wiring as per construction.

ITEM: 683.10110008 - HD IP CAMERA ASSEMBLY - BARREL TYPE
ITEM: 683.10120008 - HD IP CAMERA ASSEMBLY - DOME TYPE
ITEM: 683.10130008 - HD IP CAMERA ASSEMBLY - SOLAR POWERED DOME TYPE

- HD IP Camera Equipment Layouts(all physical dimensions and assembly details shall be included)
- HD IP Camera Manufacturer's Data: Submit manufacturer's data sheets indicating camera systems and components proposed for use, including instruction manuals.
- Camera mounting details (including foundation, cabinet base details and pole mounting details). The shop drawing shall include the details of mounting, physical mounting hardware details, connectors and all terminations of the wires.
- HD IP Camera Equipment in Field Cabinet Placement (locations for the camera equipment components)
- HD IP Camera Assembly Power and Communication/Network and control wiring Diagram (all equipment connections and interfaces shall be included). The contractor submittal shall have complete shop drawings including connection diagrams for interfacing equipment, list of connected equipment.
- HD IP Camera Assembly Test Plan and Test Results (Submit results of field testing of every device including date, testing personnel, retesting date if applicable, and confirmation that every device passed field testing.)
- HD IP Camera Assembly equipment, cables and wiring labeling details
- Operation and Maintenance Data: Submit manufacturer's operation and maintenance data, customized to the system installed. Include system and operator manuals.
- Complete list of replaceable parts including names of vendors for parts not identified by universal part numbers such as JEDEC, RETMA or EIA

All HD IP Camera Assembly drawing shall be 11 x 17 size. All drawing shall be submitted in hard copy and electronic, and CAD (Microstation) formats. The Final HD IP Camera Assembly Drawing Package shall be signed by the contractor. Each HD IP Camera Assembly shall be supplied with three (3) copies of the Final HD IP Camera Assembly Drawing Package. One (1) copy shall be placed in a clear plastic envelope and left in the CCTV Field cabinet. Two (2) copies shall be delivered to the Engineer and the regional TMC. The Electronic/CAD (Microstation) copies shall be submitted to the regional TMC.

METHOD OF MEASUREMENT:

Each HD IP Camera Assembly will be measured as the number of complete units furnished, installed and tested.

BASIS OF PAYMENT:

The unit price bid for each HD IP Camera Assembly shall include the cost of furnishing all labor, materials, tools, pedestal, equipment and incidentals as necessary to complete the work.

ITEM: 683.10110008 - HD IP CAMERA ASSEMBLY - BARREL TYPE
ITEM: 683.10120008 - HD IP CAMERA ASSEMBLY - DOME TYPE
ITEM: 683.10130008 - HD IP CAMERA ASSEMBLY - SOLAR POWERED DOME TYPE

Progress payments will be made as follows:

Twenty Five percent (25%) of the bid price of each item will be paid upon satisfactory completion and approval of the HD IP Camera Assembly Submittal.

Sixty percent (60%) will be paid upon satisfactory completion of the HD IP Camera Assembly Test.

Fifteen percent (15%) will be paid upon satisfactory completion of 90-Day Operational Test of the HD IP Camera Assembly.

ITEM 683.92211208 - FIBER OPTIC CABLE - 12 FIBERS
ITEM 683.92212408 - FIBER OPTIC CABLE - 24 FIBERS
ITEM 683.92213608 - FIBER OPTIC CABLE - 36 FIBERS
ITEM 683.92214808 - FIBER OPTIC CABLE - 48 FIBERS
ITEM 683.92216008 - FIBER OPTIC CABLE - 60 FIBERS
ITEM 683.92217208 - FIBER OPTIC CABLE - 72 FIBERS
ITEM 683.92219608 - FIBER OPTIC CABLE - 96 FIBERS

DESCRIPTION:

Under these items, the Contractor shall furnish, install and test loose tube single mode fiber optic cables as shown in the plans and as directed by the Engineer.

All equipment required for installation and testing shall be provided by the Contractor. Fiber optic patch panels, splice closures, connectors, snowshoes and pull boxes shall be supplied under other contract items.

Any other ancillary components required to form a complete fiber optic cable plant, including but not limited to, moisture and water sealants, cable caps, fan-out kits, etc., shall be supplied under these items for fiber optic cable and will not be paid for separately.

MATERIALS:

The single mode fiber optic cable shall incorporate a loose buffer tube cable design as specified herein. The fiber optic cable shall be suitable for conduit and aerial installation, supported by a messenger cable, in an outside cable plant environment and for indoor cabling environments when installed in accordance with the current NEC and local building code requirements.

A design using flooding compounds, water-swellable tape or yarn to prevent water penetration between the buffer tubes shall be provided.

The cable shall meet the latest revision requirements of REA 7 CFR1755.900 at a minimum, and shall be new, unused and of current design and manufacture.

The number of fibers in each cable shall be as specified on the plans.

Splicing Requirements

All optical fibers shall be spliced to provide continuous runs. Splices shall be made at locations shown on the plans. Any other splices in the trunk cables shall be permitted only with the approval of the Engineer.

All splices shall use the fusion technique. Fusion splicing equipment shall be provided by the Contractor and shall be cleaned, calibrated and specifically adjusted to the fiber and environmental conditions at the start of each shift. Tools and procedures shall be approved by the cable manufacturer as being compatible with the cable type being delivered.

Each spliced fiber shall be packaged in a protective sleeving or housing. Bare fibers shall be completely re-coated with a protective RTV, gel or similar substance, prior to application of the

sleeve or housing, so as to protect the fiber from scoring, dirt or microbending.

Splice trays shall be used to hold the spliced fibers, with each fiber neatly secured to the tray.

Splice loss shall not exceed a mean of 0.03 dB. No splice losses above 0.06 dB shall be permitted. If a splice is measured to exceed 0.06 dB during the splicing process, it shall be remade until its loss falls below 0.06 dB. Each attempt shall be recorded for purposes of acceptance.

All splice losses shall be recorded in tabular form and submitted to the Engineer for approval. If an optical time domain reflectometer (OTDR) is used to record splice loss, chart recordings of the "signature" shall be submitted with the splice data with a record of all OTDR settings and the OTDR locations written on the trace.

Splices specifically required for connecting drop cables or miscellaneous spur cables into the trunk/backbone cable system shall be supplied under another contract item. Splices of trunk/backbone cable segments directly to each other that are required due to reel length or other practical limitations shall be included under these items and shall not be paid for separately.

If splices to fiber optic A pigtails at (short one-fiber cables with connectors attached at the factory) are used to provide the method of connectorizing the fibers at the field cabinets and other termination points, these splices will be paid for under the item for fiber optic connectorization and not under the item for splicing.

Slack Storage of Fiber Optic Cables

As part of these items, slack fiber shall be supplied as necessary for maintenance coils and to allow for splicing of the fiber optic cables in a controlled environment such as a splicing van or tent. The slack fiber shall then be stored underground in the fiber optic pull boxes.

Optical Requirements

Attenuation: The attenuation shall be less than 0.64 decibels/mile (dB/mile) at a wavelength of 5.16×10^{-5} inches and less than 0.48 dB/mile at a wavelength of 6.10×10^{-5} inches. Fiber attenuation shall be uniform with no discontinuities greater than 0.1 dB. The attenuation at 5.44×10^{-5} inches + 1.18×10^{-7} inches shall not exceed 3.36 dB/mile. The attenuation measurements shall be in accordance with the latest EIA/TIA Standards FOTP-20, 59, 61 and 78. The average change in attenuation at extreme operational temperatures (-40^{o} F to + 158^{o} F) shall not exceed 0.081 dB/mile at 6.10×10^{-5} inches. The magnitude of the maximum attenuation change of each individual fiber shall not be greater than 0.24 dB/mile at 6.10×10^{-5} inches. The change in

attenuation measurements shall be in accordance with the latest revisions of EIA/TIA Standard FOTP-3.

Cutoff Wavelength: The fiber cutoff wavelength shall be less than or equal to 4.96×10^{-5} inches. Mode-Field Diameter: $3.62 \times 10^{-4} \pm 1.57 \times 10^{-5}$ inches at 5.16×10^{-5} inches; $4.09 \times 10^{-4} \pm 3.15 \times 10^{-5}$ inches at 6.10×10^{-5} inches.

Zero Dispersion Wavelength: 5.17×10^{-5} inches $\pm 3.94 \times 10^{-7}$ inches

Zero Dispersion Slope: Shall be less than or equal to 0.092 ps/(nm^2.km)

Polarization Mode Dispersion: Shall be less than or equal to 0.5 ps/(km)^2

Chromatic Dispersion: The chromatic dispersion shall be less than 3.3 ps/(nm.km) for 5.06×10^{-5} inches through 5.24×10^{-5} inches and less than 18 ps/(nm.km) at 6.10×10^{-5} inches as measured in accordance with the latest revision of EIA/TIA Standard FOTP-169.

Mechanical Requirements

Fibers: All optical fibers shall be Corning, Spectrum or Lucent single mode glass fibers or approved equivalent. All fibers within a given cable shall be from the same manufacturer, and shall contain no factory splices. Each fiber shall conform to the following minimum requirements:

Typical Core Diameter: 3.23×10^{-4} inches

Cladding Diameter: $4.92 \times 10^{-3} \pm 3.94 \times 10^{-5}$ inches

Core-to-Cladding Offset: less than or equal to 3.15×10^{-5} inches

Cladding Non-Circularity: less than or equal to 1.0%

Color Coating: Each fiber shall have a color coating applied to it by the manufacturer. The coating shall not affect the optical characteristics of the fiber. The basic color configuration shall be as follows, in accordance with EIA/TIA-598:

1.	Blue	7.	Red
2.	Orange	8.	Black
3.	Green	9.	Yellow
4.	Brown	10.	Violet
5.	Slate	11.	Rose
6.	White	12.	Aqua

The nominal colored fiber diameter shall be 9.84×10^{-3} inches.

ITEM 683.92211208 - FIBER OPTIC CABLE - 12 FIBERS
ITEM 683.92212408 - FIBER OPTIC CABLE - 24 FIBERS
ITEM 683.92213608 - FIBER OPTIC CABLE - 36 FIBERS
ITEM 683.92214808 - FIBER OPTIC CABLE - 48 FIBERS
ITEM 683.92216008 - FIBER OPTIC CABLE - 60 FIBERS
ITEM 683.92217208 - FIBER OPTIC CABLE - 72 FIBERS
ITEM 683.92219608 - FIBER OPTIC CABLE - 96 FIBERS

Primary Coating: Each fiber shall have a dual layered, UV acrylate coating applied to it by the manufacturer. The coating shall be mechanically strippable without damaging the fiber. The coating diameter shall be $9.64 \times 10^{-3} \pm 1.97 \times 10^{-4}$.

The force required to mechanically remove at least 1 3/16 inches of unaged coating shall not exceed 2.25 lbf as measured in accordance with the latest revision of EIA/TIA Standard FOTP-178.

Central Strength Member: The anti-buckling central strength member shall consist of a Kevlar or epoxy-glass composite rod.

Buffering: All fibers shall be enclosed in non-conductive loose buffer tubes. Each buffer tube shall contain up to twelve fibers. The Contractor shall submit the fiber count per buffer tube and the buffer tube count configuration to the Engineer for approval. The fiber shall not adhere to the inside of the buffer tube. Each buffer tube containing fibers shall be color coded in a similar scheme as the fiber color. The basic color configuration shall be as follows, in accordance with EIA/TIA-598:

1.	Blue	7.	Red
2.	Orange	8.	Black
3.	Green	9.	Yellow
4.	Brown	10.	Violet
5.	Slate	11.	Rose
6.	White	12.	Aqua

In buffer tubes containing multiple fibers, the colors shall be stable during temperature cycling and not be subject to fading or smearing onto each other or into the gel filling material. Colors shall not cause fibers to stick together. Buffer tubes shall be of dual layer construction.

The buffer tubes shall be filled with a hydrocarbon-based gel to prevent water and moisture penetration. The gel shall contain anti-oxidant additives, and the gel shall be readily removable with conventional solvents. The gel shall be non-toxic and dermatologic ally safe to exposed skin. It shall be chemically and mechanically compatible with all cable components, non-nutritive to fungus, non-hygroscopic and electrically non-conductive.

Filler Rods: Filler rods shall be used to fill all unused buffer tubes, or shall be used instead of unused buffer tubes. The filler rod shall be a solid polyethylene material and shall be natural in

color. The filler rods shall maintain the concentricity of the cable cross section where required.

Stranding: The buffer tubes shall be stranded around the central strength member using an approved stranding process to form a tight cable core. Binders shall be applied with sufficient tension to secure the tubes to the central member without crushing the buffer tubes.

Core and Cable Flooding: To prevent water penetration outside of the buffer tubes, all cavities within the cable shall be filled with a flooding compound or water blocking tape shall be used. The flooding compounds shall not affect the optical characteristics of the cable. The flooding compound shall contain anti-oxidant additives, and shall be readily removable with conventional solvents. The flooding compound shall be non-toxic and dermatologic ally safe to exposed skin. It shall be chemically and mechanically compatible with all cable components, non-nutritive to fungus, non-hygroscopic and electrically non-conductive.

Tensile Strength Provisions: Aramid yarn shall be helically stranded evenly around the cable core to provide tensile strength. The yarn shall enable the cable to withstand a maximum pulling tension of 606.98 lbf during installation and 200.08 lbf longterm installed without changing the characteristics of the optical fibers. Each length of cable shall have sufficient strength to be installed in continuous lengths as specified on the plans.

Outer Jacket: A medium density polyethylene (or approved equal) outer jacket shall be applied over the entire cable assembly. The outer jacket shall have a minimum nominal jacket thickness of .06 inches. The polyethylene shall contain carbon black and shall not promote the growth of fungus. The outer jacket shall contain no metallic elements and shall be of a consistent thickness.

The jacket shall be marked in contrasting color at 3.28 feet intervals with the following information:

NYSDOT - XX - YYZZ, where XX shall equal the number of optical fibers in the cable and YYZZ shall be the month and year that the cable was manufactured.

In addition, the outer jacket shall have sequential meter markings as approved by the Engineer. The actual length of the cable shall be within 1% of the length markings.

ITEM 683.92211208 - FIBER OPTIC CABLE - 12 FIBERS
ITEM 683.92212408 - FIBER OPTIC CABLE - 24 FIBERS
ITEM 683.92213608 - FIBER OPTIC CABLE - 36 FIBERS
ITEM 683.92214808 - FIBER OPTIC CABLE - 48 FIBERS
ITEM 683.92216008 - FIBER OPTIC CABLE - 60 FIBERS
ITEM 683.92217208 - FIBER OPTIC CABLE - 72 FIBERS
ITEM 683.92219608 - FIBER OPTIC CABLE - 96 FIBERS

Ripcord: To facilitate cable preparation, the cable shall have an orange colored ripcord located under the outer jacket.

Bend Radius. The cable shall be capable of withstanding a minimum bending radius of 10 times its outer diameter during operation and 20 times its outer diameter during installation without changing the characteristics of the optical fibers.

Other Requirements

Manufacturer's Certification: The following tests shall be performed and the results documented for a cable meeting the requirements herein. The cable manufacturer shall certify that each reel of cable furnished meets or exceeds the following specifications:

Water Penetration: When 3.28 foot static head of water or equivalent continuous pressure is applied at one end of 3.28 foot length of filled cable for 24 hours, no water shall leak through the open cable end. If the first sample fails, subsequent tests shall be done in accordance with either BELLCORE TR-TSY-000020 or REA PE-90. All water penetration testing shall be performed in accordance with EIA/TIA Standard FOTP-82.

Filling Compound Flow: When tested in accordance with EIA/TIA Standard FOTP-81, the cable shall exhibit no flow (drip or leak) of filling or flooding compound at $158^{o} \pm 35.6^{o}$ F. If material flow is detected, the weight of any compound that drips from the sample shall be less than 1.1×10^{-4} lbs.

Compressive Strength: The cable shall withstand a minimum compressive load of 125.62 lbf/in applied uniformly over the length of the compression plate. The cable shall be tested in accordance with EIA/TIA Standard FOTP-41, except that the load shall be applied at the rate of 0.098 inches per minute and maintained for 1 minute. The magnitude of the attenuation change shall be within the repeatability measurement system for 90% of the test fibers. The remaining 10% of the fibers shall not experience an attenuation change greater than 0.1 dB at 6.10×10^{-5} inches. The repeatability of the measurement system is typically + 0.05 dB or less. No fibers shall exhibit a measurable change in attenuation after load removal.

Impact Resistance: When tested in accordance with EIA/TIA Standard FOTP-25, the cable shall withstand 20 impact cycles. The magnitude of the attenuation change shall be within the

repeatability of the measurement system for 90% of the test fibers. The remaining 10% of the fibers shall not experience an attenuation change greater than 0.1 dB at 6.10×10^{-5} inches. The repeatability of the measurement system shall be + 0.05 dB or less. The cable jacket shall exhibit no cracking or splitting upon completion of the test.

Cable Flex: When tested in accordance with EIA/TIA Standard FOTP-104, the cable shall withstand 25 mechanical flexing cycles at a rate of 30 + 1 cycles per minute with a sheath diameter not greater than 20 times the cable diameter. The magnitude of the attenuation change shall be within the repeatability of the measurement system for 90% of the test fibers. The remaining 10% of the fibers shall not experience an attenuation change greater than 0.1 dB at 6.10×10^{-5} inches. The repeatability of the measurement system shall be + 0.05 dB or less. The cable jacket shall exhibit no cracking or splitting when observed under five times magnification.

Cable Freezing: When tested in accordance with EIA/TIA Standard FOTP-98, the cable shall be immersed in water. Upon freezing, the magnitude of the attenuation change shall be within the repeatability of the measurement system for 90% of the test fibers. The remaining 10% of the fibers shall not experience an attenuation change greater than 0.1 dB at 6.10×10^{-5} inches. The repeatability of the measurement system shall be + 0.05 dB or less. The cable jacket shall exhibit no cracking.

Jacket Shrinkage: When tested in accordance with EIA/TIA Standard FOTP-86, the maximum outer cable jacket shrinkback shall be less than 5%.

Lightning Protection: When tested in accordance with the proposed EIA/TIA Standard FOTP-181, the cable shall withstand a simulated lightning strike with a peak value of the current pulse greater than or equal to 105 kA. The test current used shall be damped oscillatory with a maximum time-to-peak value of 15 µs (which corresponds to a minimum frequency of 16.7 kHz) and a maximum frequency of 30 kHz. The time to half-value of the waveform envelope shall be from 40-70 ìs.

Cable Twist: When tested in accordance with EIA/TIA Standard FOTP-85, a length of cable no longer than 6½ feet shall withstand 10 cycles of mechanical twisting. The magnitude of the attenuation change shall be within the repeatability of the measurement system for 90% of the test fibers. The remaining 10% of the fibers shall not experience an attenuation change greater than 0.1 dB at 6.10×10^{-5} inches. The repeatability of the measurement system shall be + 0.05

dB or less. The cable jacket shall exhibit no cracking or splitting when observed under five times magnification.

Quality Assurance Provision: All optical fibers shall be proof tested by the fiber manufacturer at a minimum load of 145 psi.

All optical fibers shall be attenuation tested. The attenuation of each fiber shall be provided with each reel of cable furnished.

Environmental Requirements: The cable shall meet all of its specified requirements during and after being subjected to any combination of the following requirements:

Shipping/storage temperature: -58^{o} F to $+158^{o}$ F
Installation temperature: -22^{o} F to $+158^{o}$ F
Operating temperature: -40^{o} F to $+158^{o}$ F
Relative humidity: From 0% to 95%, non-condensing

CONSTRUCTION DETAILS:

Experience Requirements
Personnel involved in the installation, splicing and testing of the fiber optic cables shall meet the following requirements:

A minimum of three (3) years of experience in the installation of fiber optic cables; including fusion splicing, terminating and testing single mode fibers.

Have installed two systems where fiber optic cables are outdoors aerially and in conduit and where the systems have been in continuous satisfactory operation for at least two years. The Contractor shall submit as proof, photographs or other supporting documents, and the names, addresses and telephone numbers of the operating personnel who can be contacted regarding the installed fiber optic systems.

One fiber optic cable system (which may be one of the two in the preceding paragraph) that the Contractor can arrange for demonstration to NYSDOT representatives and the Engineer.

ITEM 683.92211208 - FIBER OPTIC CABLE - 12 FIBERS
ITEM 683.92212408 - FIBER OPTIC CABLE - 24 FIBERS
ITEM 683.92213608 - FIBER OPTIC CABLE - 36 FIBERS
ITEM 683.92214808 - FIBER OPTIC CABLE - 48 FIBERS
ITEM 683.92216008 - FIBER OPTIC CABLE - 60 FIBERS
ITEM 683.92217208 - FIBER OPTIC CABLE - 72 FIBERS
ITEM 683.92219608 - FIBER OPTIC CABLE - 96 FIBERS

Splicers shall have been trained and certified by the manufacturer of the fiber splice material to be used, in fiber optic splicing procedures. Proof of this training shall be submitted to the Engineer for approval.

Installers shall have been trained and certified by the manufacturer of the fiber optic cable to be used in fiber optic cable installation and handling procedures. Proof of this training shall be submitted to the Engineer for approval.

Personnel involved in testing shall have been trained and certified by the manufacturer of the fiber optic cable test equipment to be used, in fiber optic cable testing procedures. Proof of this training shall be submitted to the Engineer for approval.

Constructibility Review

The Contractor shall perform a careful and complete Constructibility Review of the proposed fiber optic system design. At least one month prior to beginning installation, the Contractor shall submit a report detailing the results of this review.

Installation in Conduit

The cable pulling operation shall be performed such that a minimum bending of the cable shall occur in the unreeling and pulling operations. Entry guide chutes shall be used to guide the cable into the pullbox conduit ports. Lubricating compound shall be used to minimize friction. Corner rollers (wheels), if used, shall not have radii less than the minimum installation bending radius of the cable. A series array of smaller wheels can be used for accomplishing the bend if the array is specifically approved by the cable manufacturers. The pulling tension shall be continuously measured and shall not be allowed to exceed the maximum tension specified by the manufacturer of the cable, or fuse links and breaks shall be used to ensure that the cable tensile strength is not exceeded. The pulling system shall have an audible alarm that shall sound whenever a preselected tension level is reached. Tension levels shall be recorded continuously and shall be given to the Engineer upon request.

The number of pullboxes and their locations shall be as shown on the plans. The Contractor may be required to install the cable one pullbox at a time. The direction of the cable pull shall be determined by the Contractor and shall require the approval of the Engineer.

ITEM 683.92211208 - FIBER OPTIC CABLE - 12 FIBERS
ITEM 683.92212408 - FIBER OPTIC CABLE - 24 FIBERS
ITEM 683.92213608 - FIBER OPTIC CABLE - 36 FIBERS
ITEM 683.92214808 - FIBER OPTIC CABLE - 48 FIBERS
ITEM 683.92216008 - FIBER OPTIC CABLE - 60 FIBERS
ITEM 683.92217208 - FIBER OPTIC CABLE - 72 FIBERS
ITEM 683.92219608 - FIBER OPTIC CABLE - 96 FIBERS

The central strength member and aramid yarn shall be attached directly to the pulling eye during cable pulling. "Basket grip" or "Chinese finger" type attachments to the cable outer jacket shall not be permitted. A breakaway swivel with a cable manufacturer approved tensile rating shall be used on all pulls.

When simultaneously pulling fiber optic cable with other cables, separate grooved rollers shall be used for each cable.

No fiber optic cable shall be pulled through more than one 90 degree bend unless so indicated on the plans or specifically approved by the Engineer.

Documentation Requirements

Installation Practices for Outdoor Fiber Optic Cable Systems Documentation
At least one month prior to starting installation of the fiber optic cable plant, the Contractor shall submit to the Engineer for approval ten (10) copies of the Contractor's Installation Practices for Outdoor Fiber Optic Cable Systems at manual. This manual shall address the Contractor's proposed practices covering all aspects of the fiber optic cable plant. This submittal shall include all proposed procedures, list of installation equipment, and splicing and test equipment. Location of the splicing points with the description of the splicing function. Test and quality control procedures shall be detailed as well as procedures for corrective action.

Testing Data:
Optical Link Budget testing for point to point and closed loop fibers (for all fibers). OTDR testing plan and procedure, OTDR test data and its report (for all fibers).

Operation and Maintenance Documentation: After the fiber optic cable plant has been installed, ten (10) complete sets of Operation and Maintenance Documentation shall be provided. The documentation shall, as a minimum, include the following:

Complete and accurate as-built diagrams showing the entire fiber optic cable plant including locations of all splices.
Final copies of all approved test procedures
Complete performance data of the cable plant showing the losses at each splice location and each terminal connector.

ITEM 683.92211208 - FIBER OPTIC CABLE - 12 FIBERS
ITEM 683.92212408 - FIBER OPTIC CABLE - 24 FIBERS
ITEM 683.92213608 - FIBER OPTIC CABLE - 36 FIBERS
ITEM 683.92214808 - FIBER OPTIC CABLE - 48 FIBERS
ITEM 683.92216008 - FIBER OPTIC CABLE - 60 FIBERS
ITEM 683.92217208 - FIBER OPTIC CABLE - 72 FIBERS
ITEM 683.92219608 - FIBER OPTIC CABLE - 96 FIBERS

Complete parts list including names of vendors.
Complete maintenance and trouble-shooting procedures.

Testing Requirements

All fibers shall be tested bi-directionally at both 5.16×10^{-5} inches and 6.10×10^{-5} inches. The Contractor shall submit detailed test procedures for approval by the Engineer.

The fiber optic cables shall be subjected to the levels of testing described in the General Provisions for ITS General Provisions for this project.

METHOD OF MEASUREMENT:

The fiber optic cables will be measured for payment as the number of linear feet of cable, including lengths stored as splicing slack and maintenance coils, actually furnished and installed.

BASIS OF PAYMENT:

The unit price bid per linear foot for fiber optic cable shall include the cost of furnishing all labor, material, documentation, tools and equipment and testing of the fiber optic cable necessary to complete the work.

Fifty percent (50%) of the bid price of each item will be paid upon satisfactory completion of Milestone 3, On-Site Stand Alone Tests; twenty percent (20%) will be paid upon satisfactory completion of Milestone 4, System Interface Test; twenty percent (20%) will be paid upon satisfactory completion of Milestone 5, System Performance Tests; and ten percent (10%) will be paid upon satisfactory completion of Milestone 6, 90 Day Operational Test, as described in the ITS Special Provisions part of the contract and within the plans/proposal.

ITEM 800.01000015 – DESIGN BUILD – DESIGN SERVICES

DESCRIPTION. This work shall consist of providing design services in accordance with the contract documents.

MATERIALS. None Specified.

CONSTRUCTION DETAILS. The Design Builder shall provide Design Services by the appropriately qualified and licensed personnel in accordance with the requirements in the contract documents.

METHOD OF MEASUREMENT. Design Build - Design Services will be measured for payment on a lump sum basis.

BASIS OF PAYMENT. The lump sum price bid for Design Build - Design Services shall include the cost of furnishing all labor, equipment and incidentals to satisfactorily complete the work. Progress payments will be made in accordance with the contract documents.

ITEM 800.02000015 – DESIGN BUILD – CONSTRUCTION INSPECTION SERVICES

DESCRIPTION. This work shall consist of providing Construction Inspection Services in accordance with the contract documents.

MATERIALS. None Specified.

CONSTRUCTION DETAILS. The Design Builder shall provide Construction Inspection Services by the appropriately qualified and licensed personnel in accordance with the requirements in the contract documents.

METHOD OF MEASUREMENT. Design Build - Construction Inspection Services will be measured for payment on a lump sum basis.

BASIS OF PAYMENT. The lump sum price bid for Design Build - Construction Inspection Services shall include the cost of furnishing all labor, equipment and incidentals to satisfactorily complete the work. Progress payments will be made in accordance with the contract documents.

ITEM 800.03000015 – DESIGN BUILD – QUALITY CONTROL SERVICES

DESCRIPTION. This work shall consist of providing Quality Control Services in accordance with the contract documents.

MATERIALS. None Specified.

CONSTRUCTION DETAILS. The Design Builder shall provide Quality Control Services by the appropriately qualified and licensed personnel in accordance with the requirements in the contract documents.

METHOD OF MEASUREMENT. Design Build - Quality Control Services will be measured for payment on a lump sum basis.

BASIS OF PAYMENT. The lump sum price bid for Design Build - Quality Control Services shall include the cost of furnishing all labor, equipment and incidentals to satisfactorily complete the work. Progress payments will be made in accordance with the contract documents.

ITEM 800.04000015 – DESIGN BUILD – FORCE ACCOUNT WORK

DESCRIPTION. This work shall consist of performing construction work in accordance with the contract documents and as directed by the Engineer.

MATERIALS. None Specified.

CONSTRUCTION DETAILS. The Design Builder shall perform construction work in accordance with the contract documents as directed by the Engineer. The Design Builder will maintain and provide agreed price or force account records to document the costs in accordance with DB section 109-9.

METHOD OF MEASUREMENT. Design Build – Force Account Work will be measured for payment on a Dollar Cents basis.

BASIS OF PAYMENT. The price shown for Design Build - Force Account Work shall include the cost of furnishing all labor, materials, equipment and incidentals to satisfactorily complete the work. The total cost shown in the itemized proposal will be considered the price bid even though payment will be made only for actual work performed. The unit price amount is not to be altered in any manner by the bidder. Should the bidder alter the amount shown, the altered figure will be disregarded, and the original price will be used to determine the total amount bid for the contract.

Progress payments will be made in accordance with the contract documents.

ITEM 800.05000015 – DESIGN BUILD – SITE MOBILIZATION

DESCRIPTION. This work shall consist of providing necessary bonds, insurance, prefinancing and set up of necessary general plant, including shops, storage areas, office and such sanitary and other facilities as are required by local or state law or regulation.

MATERIALS. None Specified.

CONSTRUCTION DETAILS. The Design Builder shall provide the above facilities and service for mobilization in a safe and workmanlike manner in conformance with any pertinent local or State Law, regulation or code to the extent and at the time the Contractor deems them necessary for its operations. Good housekeeping shall be maintained.

METHOD OF MEASUREMENT. Design Build – Site Mobilization will be measured for payment on a lump sum basis.

BASIS OF PAYMENT. The lump sum price bid for Design Build – Site Mobilization shall not exceed four percent (4%) of the total contract bid price for all Construction Work items. Should the bidder exceed the foregoing four percent (4%), the Department will make the necessary adjustment to determine the total amount bid based on the arithmetically correct proposal.

Progress payments in the amount of 4% of the construction work items will be made to the Contractor with the first contract payment made for other contract work at the individual itemized work site.

ITEM 800.0600NN15 – DESIGN BUILD – CONSTRUCTION WORK

DESCRIPTION. This work shall consist of construction work in accordance with the contract documents.

MATERIALS. None Specified.

CONSTRUCTION DETAILS. The Design Builder shall perform all construction work in accordance with the requirements in the contract documents.

METHOD OF MEASUREMENT. Design Build – Construction Work will be measured for payment on a lump sum basis for each location. The individual locations are identified in the contract documents.

BASIS OF PAYMENT. The lump sum price bid for Design Build – Construction Work shall include the cost of furnishing all labor, materials, equipment, management and supervision to satisfactorily complete the work. Progress payments will be made for each construction work location in accordance with the contract documents.

Note: NN in pay item number denotes serialization by location.

ITEM 800.06XXNN15 – DESIGN BUILD – CONSTRUCTION WORK – STRUCTURAL REPAIRS

DESCRIPTION. This work shall consist of structural repair work in accordance with the contract documents and as directed by the Engineer.

MATERIALS. None Specified.

CONSTRUCTION DETAILS. The Design Builder shall perform all structural repair work in accordance with the requirements in the contract documents.

For the "unanticipated repairs" items of work, the Design Builder will maintain and provide agreed price or force account records to document the costs in accordance with DB section 109-9.

METHOD OF MEASUREMENT. Design Build – Construction Work – Structural Repairs will be measured for payment on either a lump sum or Dollars-Cents basis.

BASIS OF PAYMENT.

Steel Superstructure Repair Work – directive repairs - The lump sum price bid shall include the cost of furnishing all labor, materials, equipment, management and supervision to satisfactorily complete the work. Progress payments will be made for each construction work location in accordance with the contract documents.

Steel Superstructure Repair Work – unanticipated repairs - The price shown shall include the cost of furnishing all labor, materials, equipment and incidentals to satisfactorily complete the work, and additional necessary subcontractor work in accordance with DB 109-9.2.2, including but not limited to engineering and quality control. The total cost shown in the itemized proposal will be considered the price bid even though payment will be made only for actual work performed.

Concrete Substructure Repair Work – directive repairs - The lump sum price bid shall include the cost of furnishing all labor, materials, equipment, management and supervision to satisfactorily complete the work. Progress payments will be made for each construction work location in accordance with the contract documents.

Concrete Substructure Repair Work – unanticipated repairs - The price shown shall include the cost of furnishing all labor, materials, equipment and incidentals to satisfactorily complete the work, and additional necessary subcontractor work in accordance with DB 109-9.2.2, including but not limited to engineering and quality control. The total cost shown in the itemized proposal will be considered the price bid even though payment will be made only for actual work performed.

Progress payments will be made for each construction work location in accordance with the contract documents.

Payment will be made under:

Item No.	Item	Pay Unit
800.0601NN15	Steel Superstructure Repair Work – directive repairs	Lump Sum
800.06020015	Steel Superstructure Repair Work – unanticipated repairs	Dollars-Cents
800.0606NN15	Concrete Substructure Repair Work – directive repairs	Lump Sum
800.06070015	Concrete Substructure Repair Work– unanticipated repairs	Dollars-Cents

Note: NN in pay item number denotes serialization by location.

DESCRIPTION. This work shall consist of furnishing materials in accordance with the contract documents and as directed by the Engineer.

MATERIALS. As specified in the Final Requests for Proposals, Part 5, Special Provision 12.

CONSTRUCTION DETAILS.

None Specified.

METHOD OF MEASUREMENT. Design Build – Materials will be measured for payment on Dollars-Cents basis.

BASIS OF PAYMENT.

Design Build – Materials - The price shown shall include the cost of furnishing all labor, materials, equipment and incidentals (transport, materials testing, etc.) to satisfactorily provide the materials. No additional payment will be made under this item for other aspects of work, including but not limited to Work Zone Traffic Control. The total cost shown in the itemized proposal will be considered the price bid even though payment will be made only for the actual materials supplied.

Progress payments will be made for materials in accordance with the contract documents.

Payment will be made under:

Item No.	Description	Pay Unit
800.07000115	Materials - LIRR	Dollars-Cents
800.07000215	Materials - NYSDOT	Dollars-Cents

ITEM 800.1000NN15 – DESIGN BUILD – UTILITY RELATED WORK

DESCRIPTION. This work shall consist of utility related work in accordance with the contract documents or owner requirements. The "owner" of each utility is identified in the contract documents.

MATERIALS. Materials shall be as specified in the contract documents or owner requirements. If none specified, then the proposed material shall be approved by the Engineer of Record before any purchase is made.

CONSTRUCTION DETAILS. The Design Builder shall perform all utility related work in accordance with the requirements in the contract documents or owner requirements. In case of a conflict with owner requirements, the owner requirements shall take precedence.

METHOD OF MEASUREMENT. *Design Build – Utility Related Work* as defined in the contract documents will be measured for payment on a fixed price lump sum basis for each utility. The individual utilities will be identified in the contract documents.

BASIS OF PAYMENT. The fixed price lump sum for Design Build – Utility Related Work shall include the cost of furnishing all labor, materials, equipment, design, construction inspection, testing, and supervision to satisfactorily complete the work. Progress payments will be made for each utility work in accordance with the contract documents.

FIXED PRICE ITEM

The fixed price shown in the proposal for this pay item is not to be altered in any manner by the Proposer. Should the amount be altered, the new figure will be disregarded and the original price will be used to determine the total amount bid for the Contract.

Note: NN in pay item number denotes serialization by each utility.